気象庁海洋月報

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Climate and Marine Department
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気象庁 気候・海洋気象部

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気象庁海洋月報は、気象庁 気候・海洋気象部 海洋気象情報室で作成しています。
本月報に関する問い合わせは、

〒100-8122　東京都千代田区大手町１-３-４　気象庁 気候・海洋気象部 海洋気象情報室まで。
電　話 (03) 3212-8341 (内線 5128、5129)
ＦＡＸ (03) 3211-3047
電子メール ocean@hq.kishou.go.jp

Monthly Ocean Report is prepared by the Office of Marine Prediction, Climate and Marine Department, Japan Meteorological Agency.

Correspondence relating to this report may be directed to :

Tsune Tanahashi
Head, Office of Marine Prediction
Climate and Marine Department, Japan Meteorological Agency
1-3-4 Ote-machi, Chiyoda-ku, Tokyo 100-8122 Japan
Facsimile: +81-3-3211-3047
e-mail : ocean@hq.kishou.go.jp

表紙は、2000 年 12 月の太平洋の月平均海面水温偏差図です。
陰影部は、平年より高温の海域を示しています。

The figure on the front cover shows the monthly mean SST anomalies for December 2000 in the Pacific Ocean.
Areas of positive anomalies are shaded.

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海況の特徴（２０００年１２月）

日本近海の海況

海面水温は、40°Nから50°Nの、140°E以東の太平洋及びオホーツク海で平年より1℃以上低く、北海道北東からオホーツク海南部にかけて2℃以上低かった。フィリピンの北から南西諸島近海、日本の南方には、東海沖を除いて、+1℃を超える正偏差が広がっていた（第４図）。

黒潮は、九州から紀伊半島にかけて接岸した後、上旬は東海沖で離岸し32.5°N、138°E付近から北東に流れていた。中・下旬は、それぞれ31°N、31.5°N付近まで南下した後、向きを変え、139°E付近を北上し、房総半島沖を北東に流れていた（第９図）。

親潮系の冷水の沿岸寄りの分枝は40.5°N、143.5°Eまで達していた（第５図）。

太平洋の海況

太平洋赤道域の海面水温は、170°E以東の広い範囲で平年より0.5℃以上低く、175°Wから160°Wにかけてと、155°W付近、及び140°W付近では-1℃を超える負偏差が見られた。

北太平洋の海面水温は、165°W以西の40°Nから50°Nで、平年より1℃以上低かった。一方、30°Nに沿った175°Wから150°Wにかけて、+1℃を超える正偏差が見られた（第１６図）。

Highlights December 2000

Seas adjacent to Japan

SSTs were more than 1℃ below normal in the Pacific east of 140°E between 40°N and 50°N and in the Sea of Okhotsk. Negative SST anomalies exceeding –2℃ were found from northeast of Hokkaido to the southern part of the Sea of Okhotsk. SSTs were more than 1℃ above normal in seas north of the Philippines, around Nansei Islands and south of Honshu except off Tokai (Fig. 4).

The Kuroshio flowed along the coasts from Kyushu to the Kii Peninsula. In the first 10-day of the month, it flowed off Tokai and turned northeastward near 32.5°N, 138°E. In the second and the last 10-days, it flowed off Tokai SSE-ward until it reached to 31°N and 31.5°N, respectively. Then it turned and flowed northward along 139°E, and flowed northeastward off the Boso Peninsula (Fig. 9).

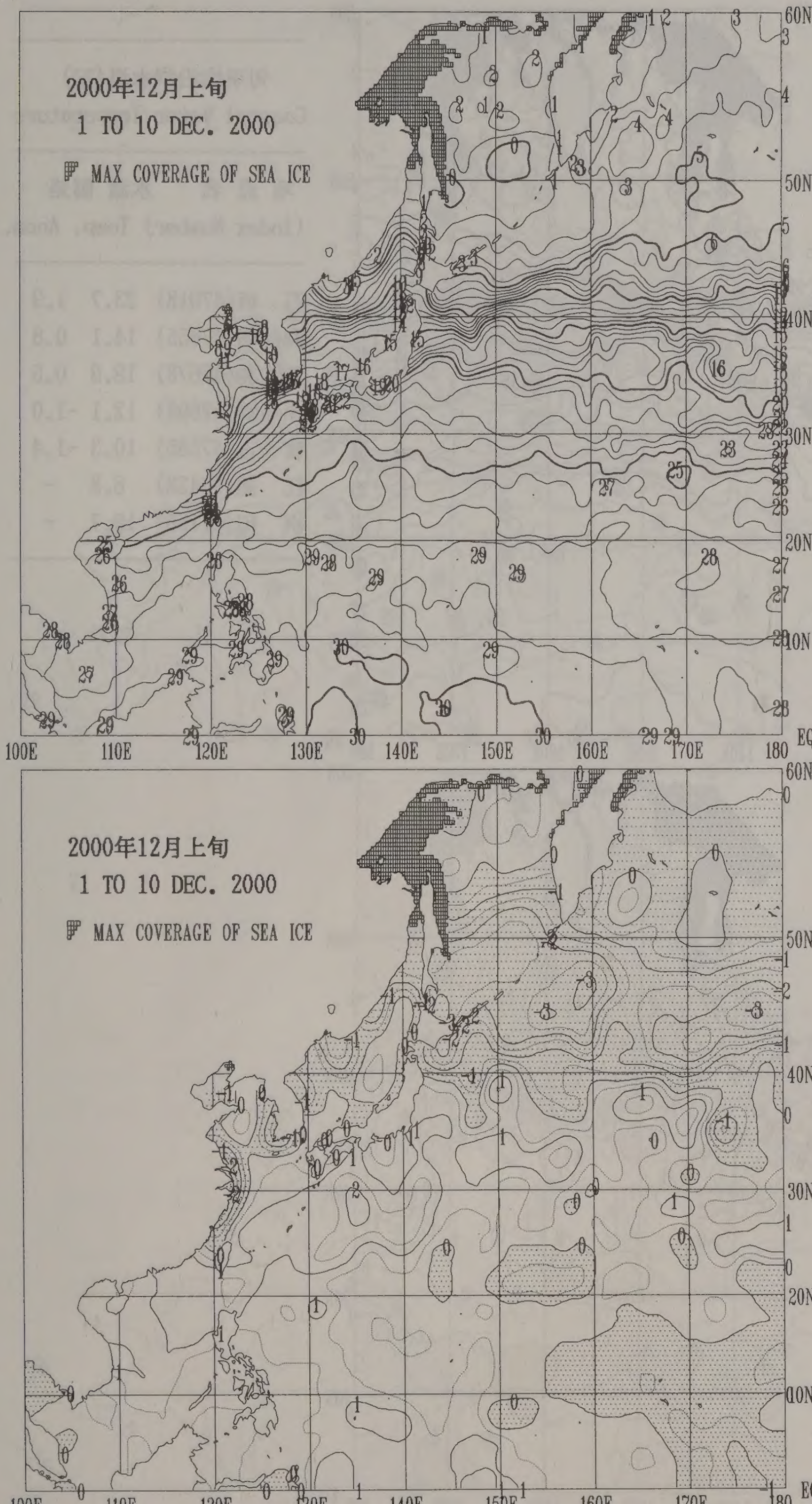
The Coastal branch of the Oyashio cold water extended southward to 40.5°N, 143.5°E (Fig. 5).

Pacific Ocean

In the equatorial Pacific, negative SST anomalies exceeding –0.5℃ were found east of 170°E, and negative SST anomalies exceeding –1℃ were found from 175°W to 160°W, near 155°W and 140°W.

In the North Pacific, SSTs were more than 1℃ below normal west of 165°W between 40°N and 50°N. Positive SST anomalies exceeding +1℃ prevailed from 175°W to 150°W along 30°N (Fig. 16).

Ten-day mean SST & Anomalies



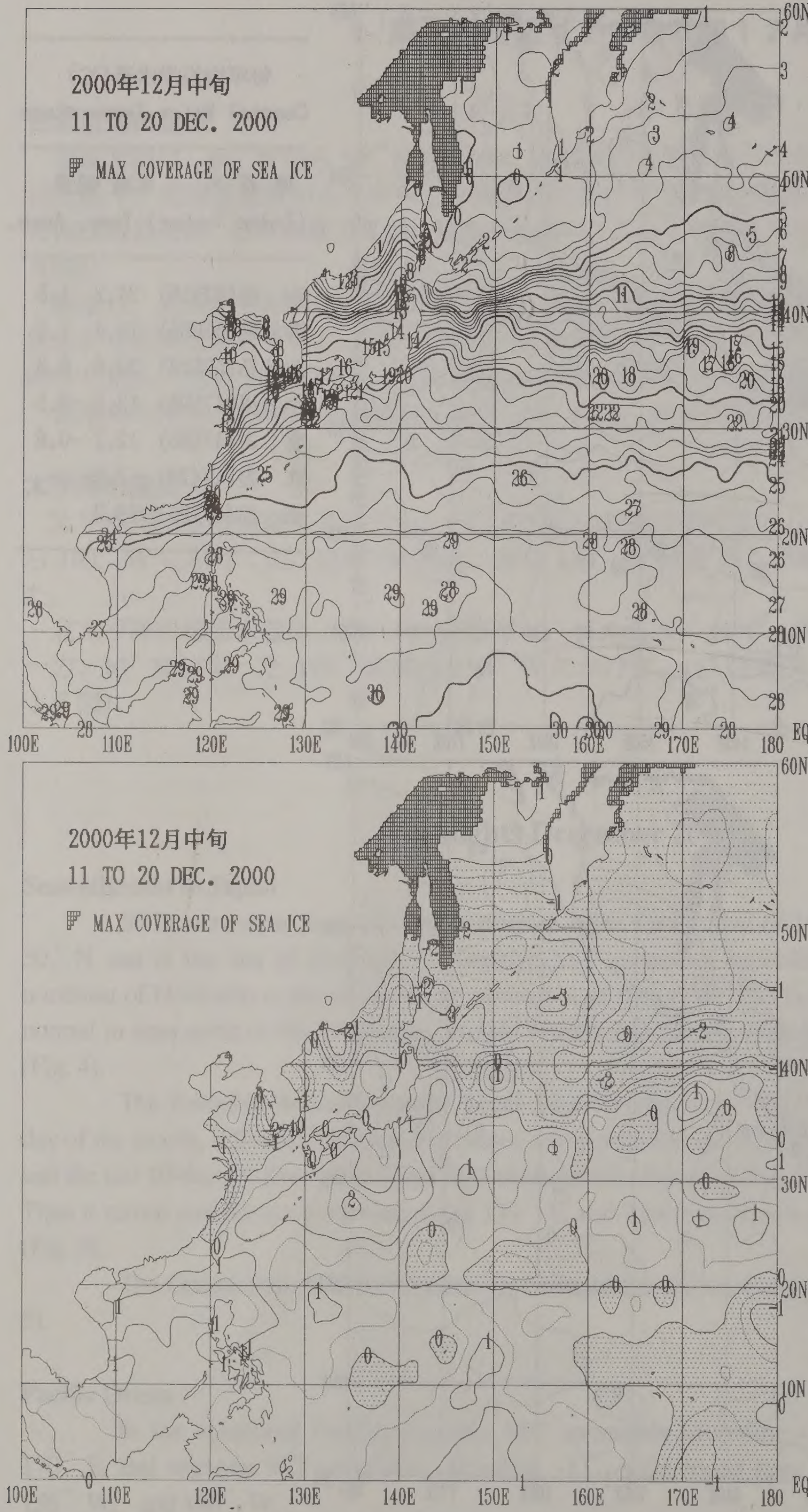
旬平均沿岸水温(℃)
Coastal Water Temperature

地点名 (Index Number)	水温 Temp.	偏差 Anom.
石　垣(47918)	24.2	1.8
御前崎(47655)	15.4	1.1
八丈島(47678)	20.8	0.8
小名浜(47598)	13.3	-0.5
宮　古(47585)	12.2	-0.6
江　差(47428)	7.8	-
浜　田(47755)	16.3	-

第1図 北西太平洋旬平均海面水温図(上)及び偏差図(下)(2000年12月上旬)

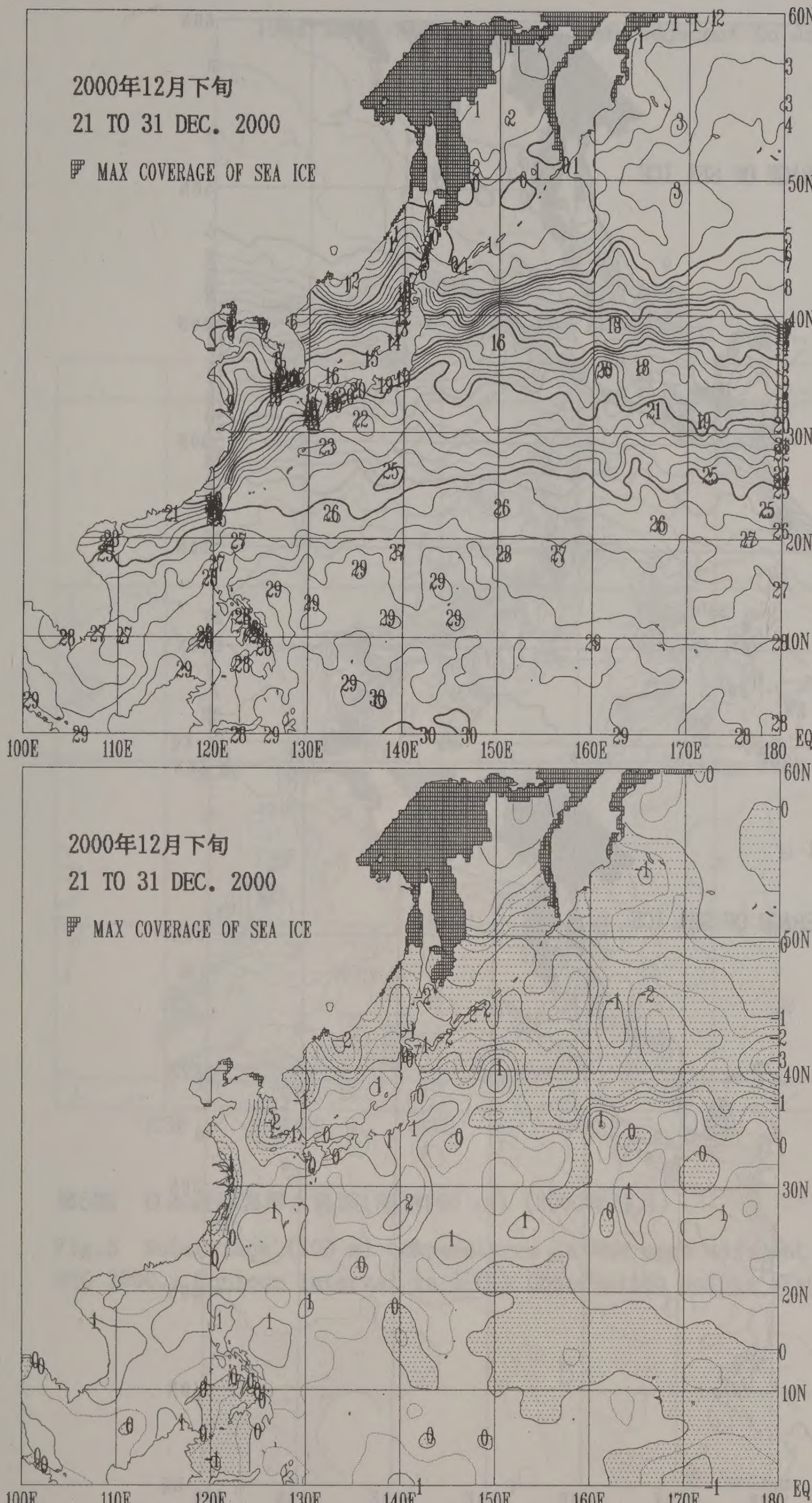
Fig.1 Ten-day mean SST (top) and anomalies (bottom) in the western North Pacific for the 1st ten-day period in DEC 2000. Anomalies are computed from the JMA climatology (1961-90). Contour interval is 1°C and additional anomaly contours of 0.5°C are shown by broken lines. Negative anomalies are spotted.

旬平均沿岸水温(℃) Coastal Water Temperature		
地 点 名 (Index Number)	水温 Temp.	偏差 Anom.
石　垣(47918)	23.7	1.9
御前崎(47655)	14.1	0.6
八丈島(47678)	19.9	0.5
小名浜(47598)	12.1	-1.0
宮　古(47585)	10.3	-1.4
江　差(47428)	6.8	-
浜　田(47755)	15.7	-



第2図 北西太平洋旬平均海面水温図(上)及び偏差図(下)(2000年12月中旬)

Fig.2 Ten-day mean SST (top) and anomalies (bottom) in the western North Pacific for the 2nd ten-day period in DEC 2000. Anomalies are computed from the JMA climatology (1961-90). Contour interval is 1°C and additional anomaly contours of 0.5°C are shown by broken lines. Negative anomalies are spotted.

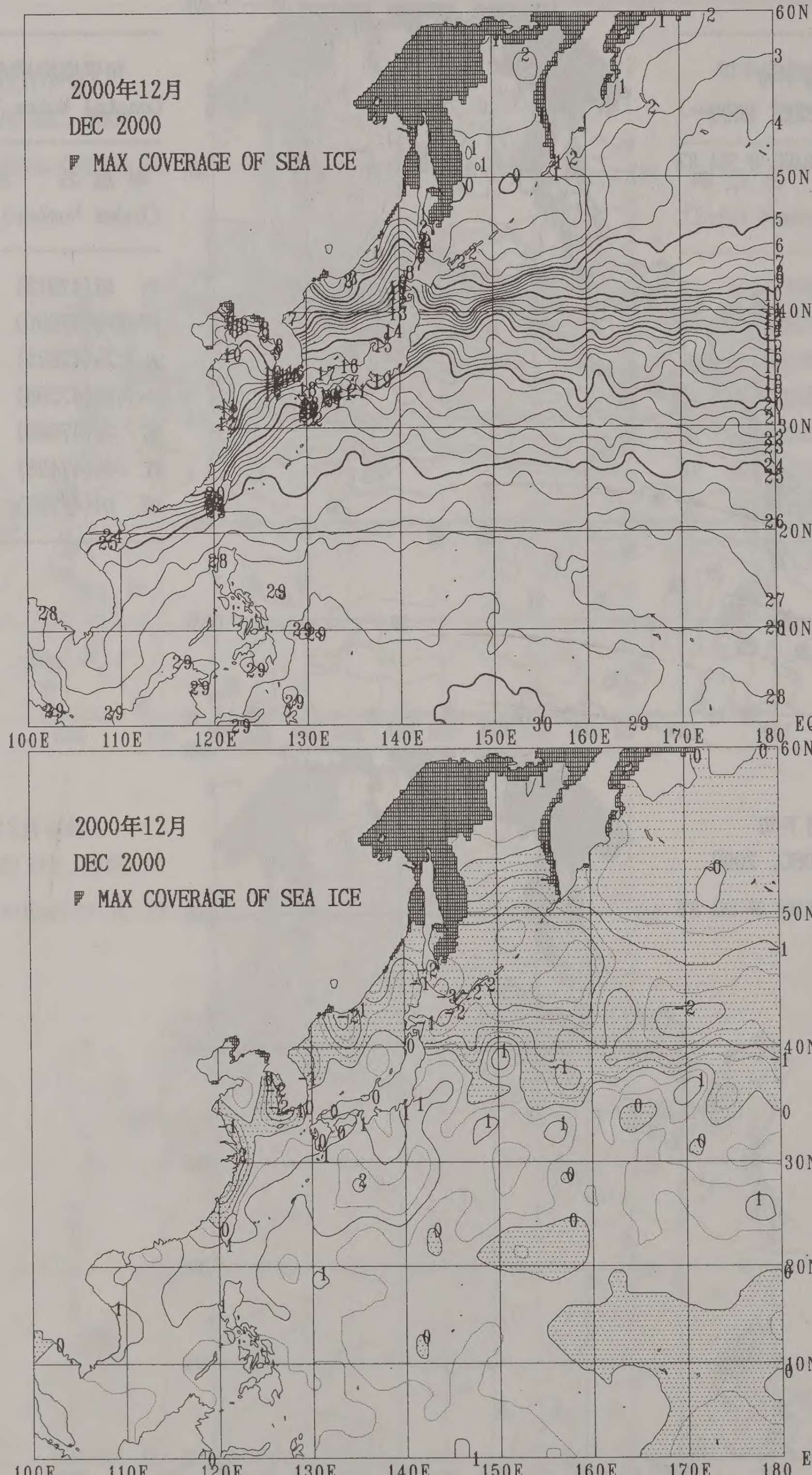


旬平均沿岸水温(℃)
Coastal Water Temperature

地点名 (Index Number)	水温 Temp.	偏差 Anom.
石　垣(47918)	23.3	1.8
御前崎(47655)	13.3	0.9
八丈島(47678)	19.4	0.8
小名浜(47598)	11.6	-0.5
宮　古(47585)	9.6	-1.1
江　差(47428)	7.0	-
浜　田(47755)	14.9	-

第3図 北西太平洋旬平均海面水温図(上)及び偏差図(下)(2000年12月下旬)

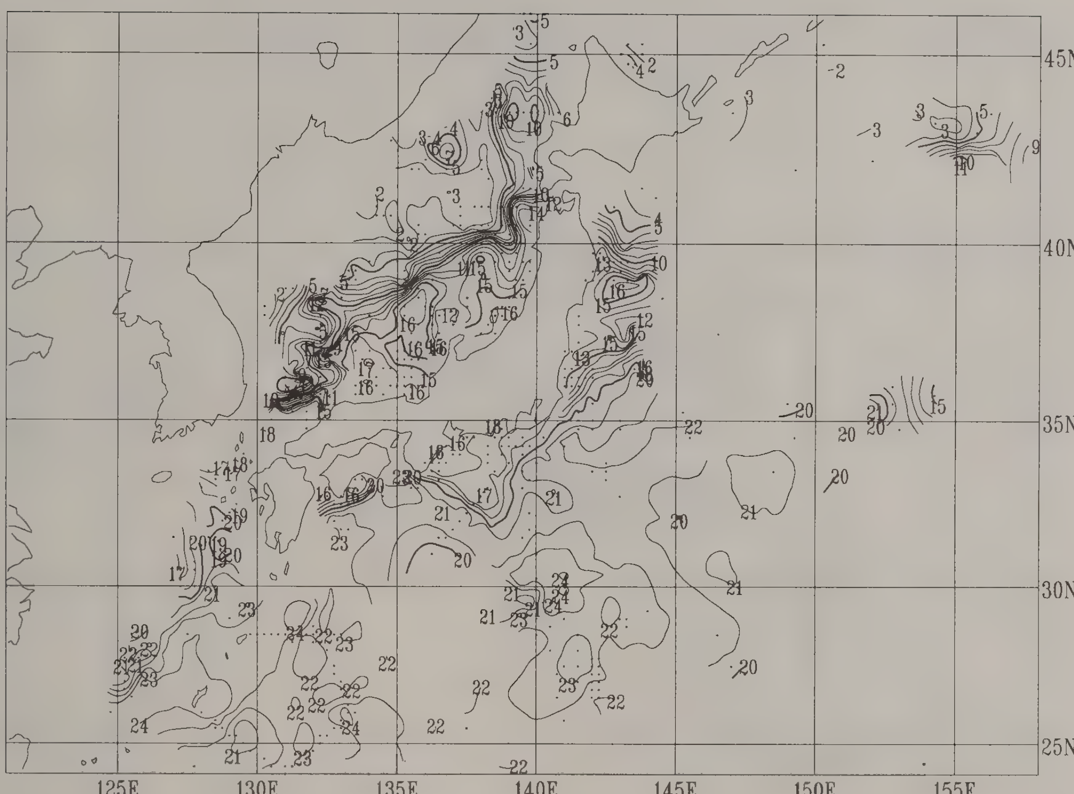
Fig.3 Ten-day mean SST (top) and anomalies (bottom) in the western North Pacific for the 3rd ten-day period in DEC 2000. Anomalies are computed from the JMA climatology (1961-90). Contour interval is 1°C and additional anomaly contours of 0.5°C are shown by broken lines. Negative anomalies are spotted.



第4図 北西太平洋月平均海面水温図(上)及び偏差図(下)(2000年12月)

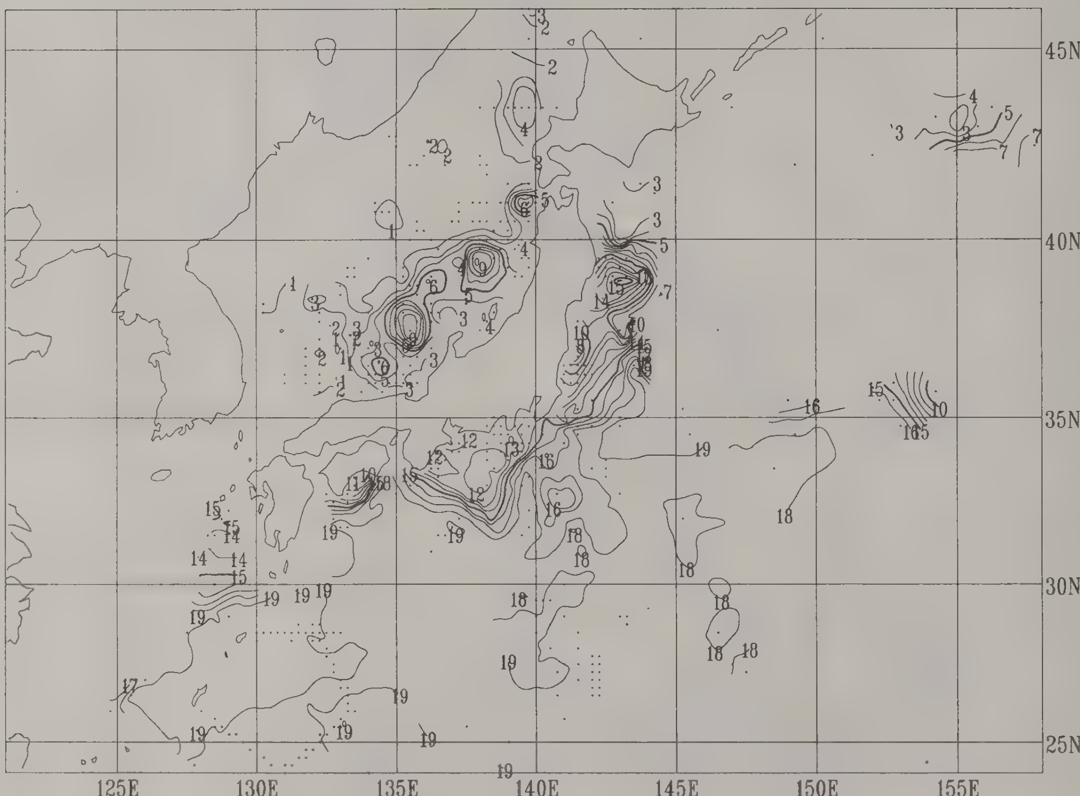
Fig.4 Monthly mean SST (top) and anomalies (bottom) in the western North Pacific for DEC 2000. Anomalies are computed from the JMA climatology (1961-1990). Contour interval is 1°C and additional anomaly contours of 0.5°C are shown by broken lines. Negative anomalies are spotted.

100m Temperatures in the Seas Adjacent to Japan



第5図　日本近海表層水温図(深さ100 m) (2000年12月)

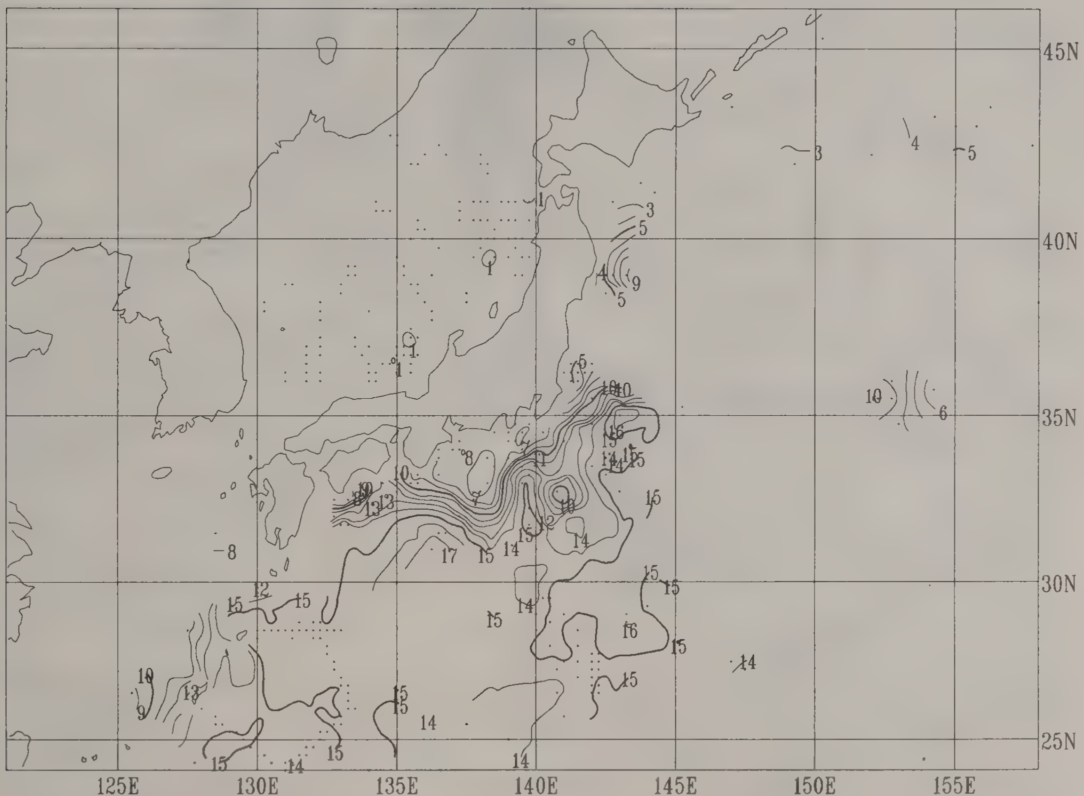
Fig.5 Subsurface (100 m) temperatures in the seas adjacent to Japan for DEC 2000. Contour interval is 1°C. Observation points are denoted by dots.



第6図　日本近海表層水温図(深さ200 m) (2000年12月)

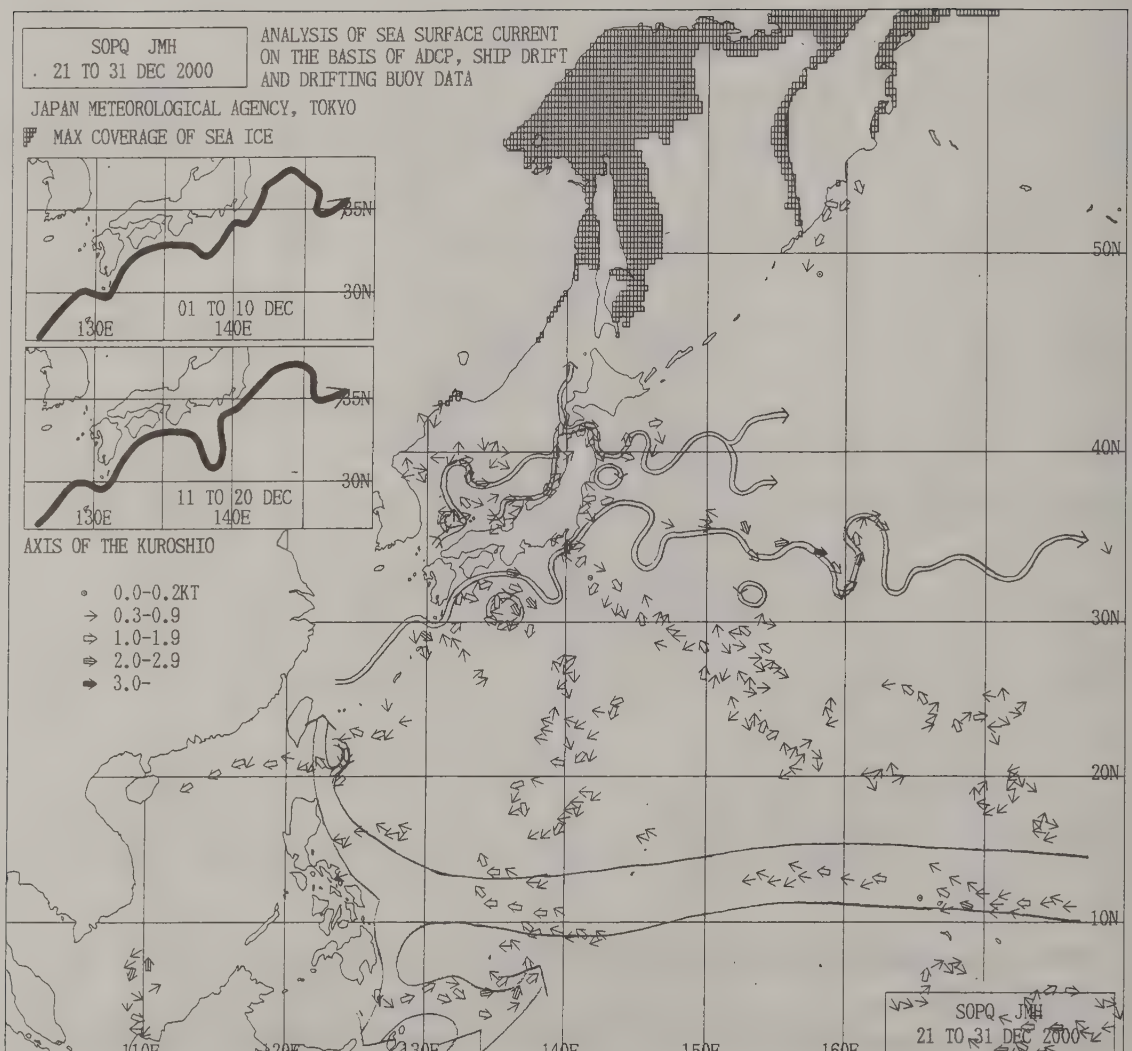
Fig.6 Subsurface (200 m) temperatures in the seas adjacent to Japan for DEC 2000. Contour interval is 1°C. Observation points are denoted by dots.

400m Temperatures in the Seas Adjacent to Japan



第7図　日本近海表層水温図(深さ400 m)(2000年12月)

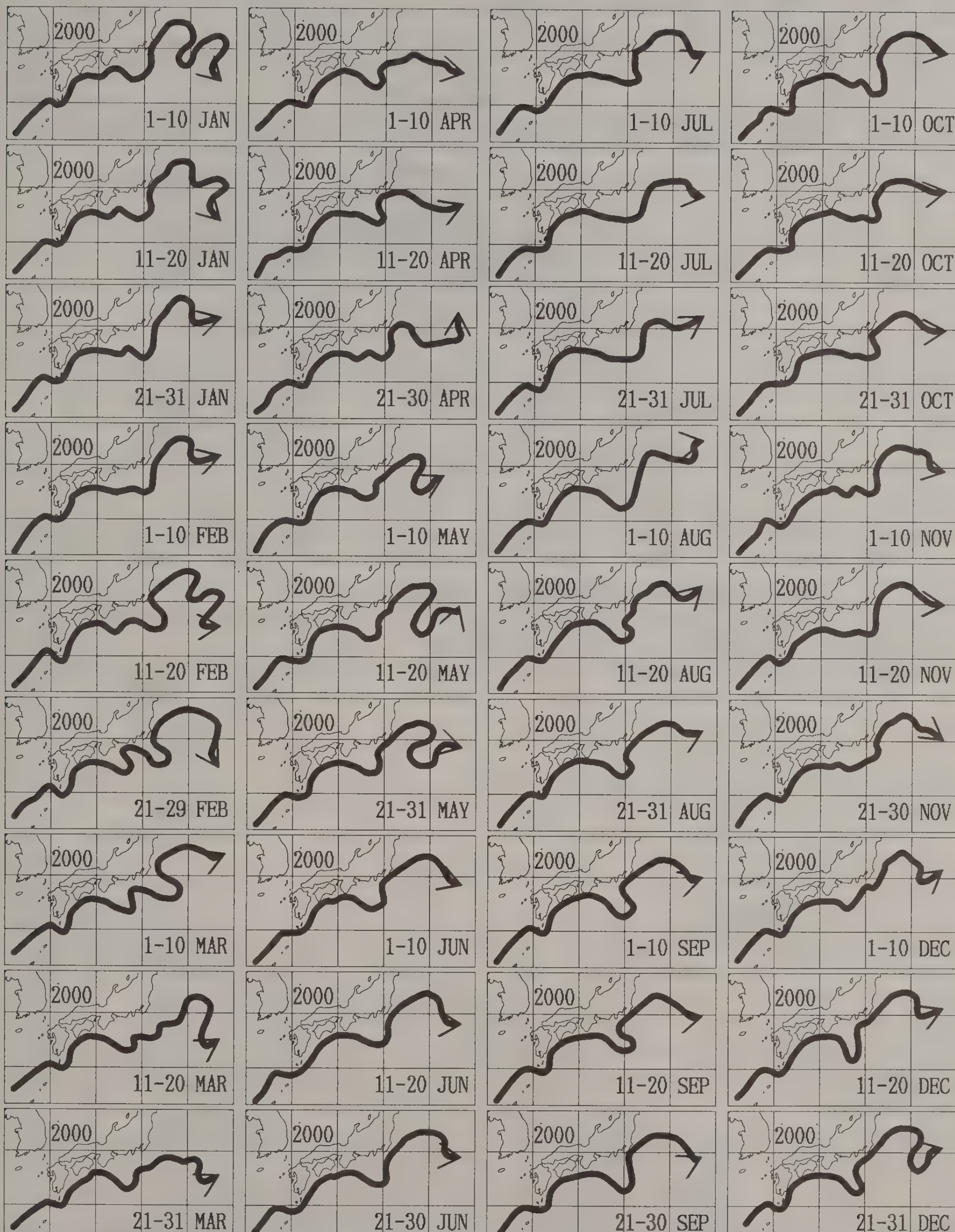
Fig.7 Subsurface (400 m) temperatures in the seas adjacent to Japan for DEC 2000. Contour interval is 1°C. Observation points are denoted by dots.



第 8 図　北西太平洋海流図 （2000 年 12 月下旬）

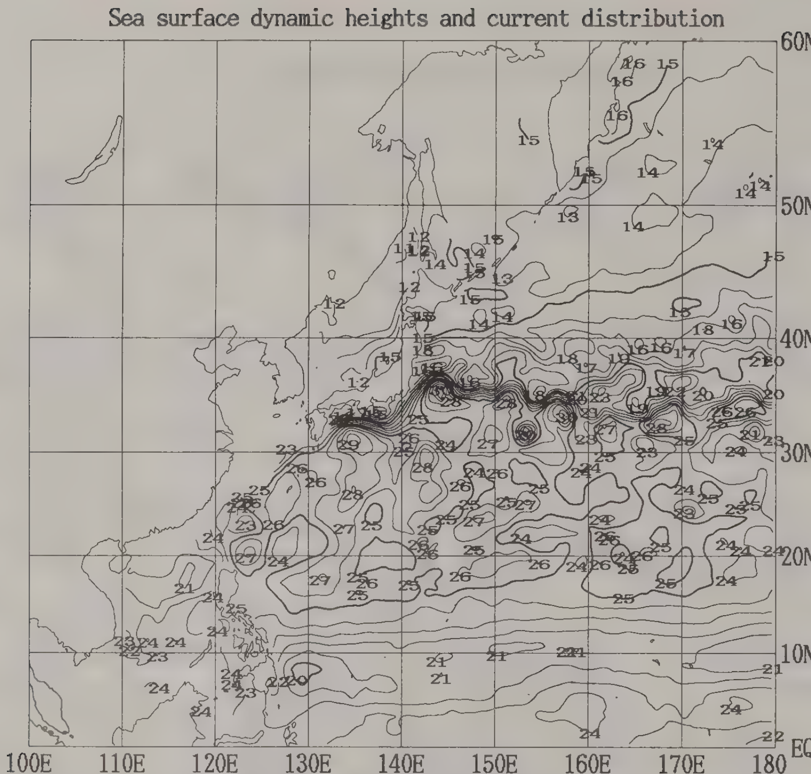
Fig. 8　Analysis of the sea surface current in the western North Pacific for the 3rd ten-day period in December 2000. Small arrows indicate *in situ* observations. Major currents such as the Kuroshio and the North Equatorial Current are denoted by larger open arrows.

Location of the Kuroshio axis



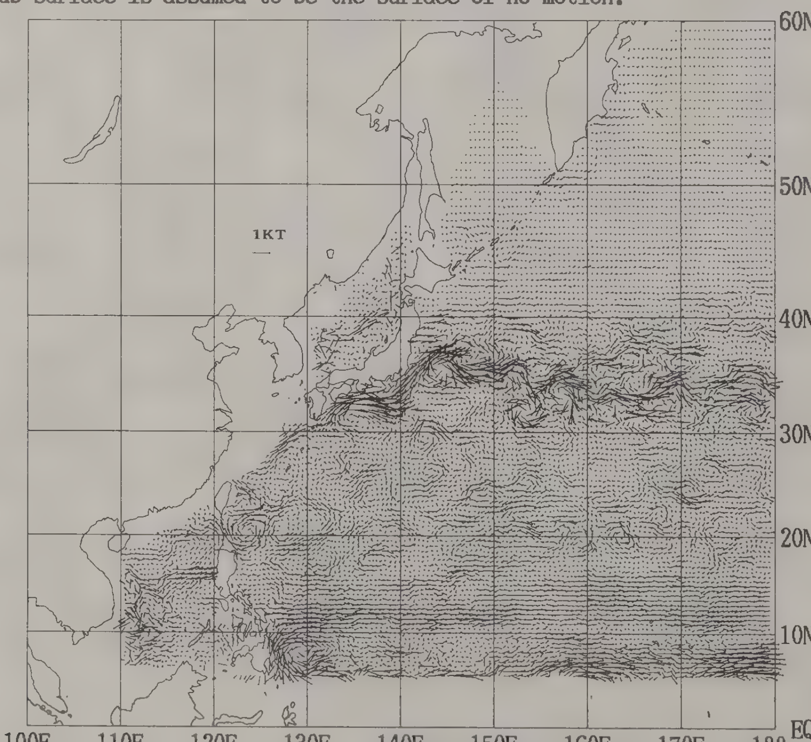
第9図 旬別黒潮流軸図

Fig.9 Location of the Kuroshio axis



第10図 北西太平洋力学的海面高度分布図(2000年12月6日)

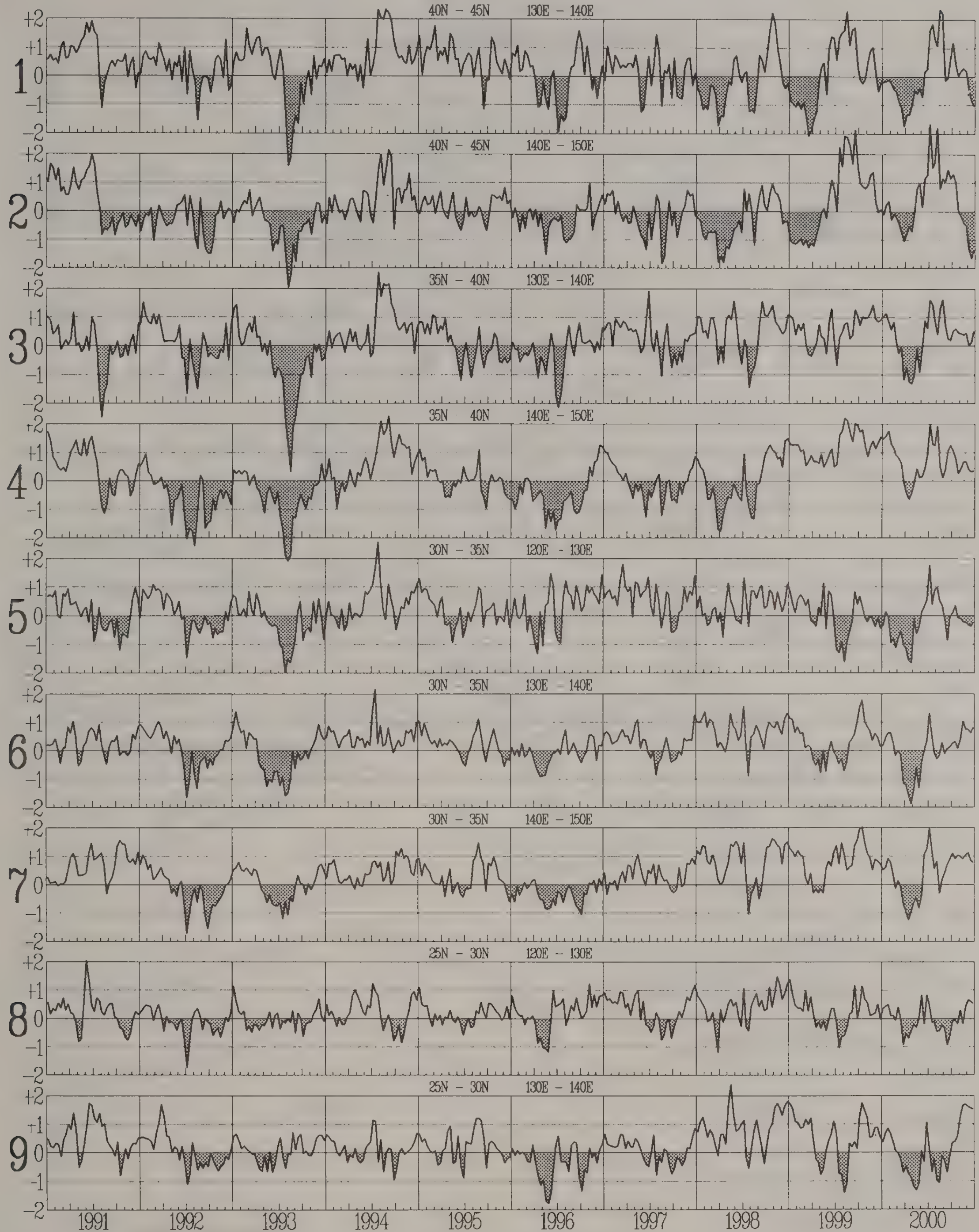
Fig.10 Sea surface dynamic heights (10 cm) in the western North Pacific derived from the altimeter data of TOPEX/POSEIDON (DEC 6, 2000).
1500 db surface is assumed to be the surface of no motion.

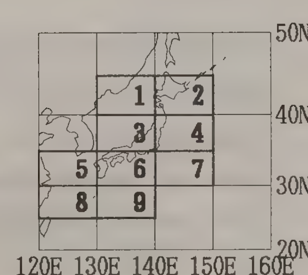


第11図 北西太平洋海流ベクトル図(2000年12月6日)

Fig.11 Sea surface current vectors in the western North Pacific (DEC 6, 2000).
Vectors are derived from the sea surface dynamic heights from TOPEX/POSEIDON and subsurface temperature distribution assuming the geostrophic relation.

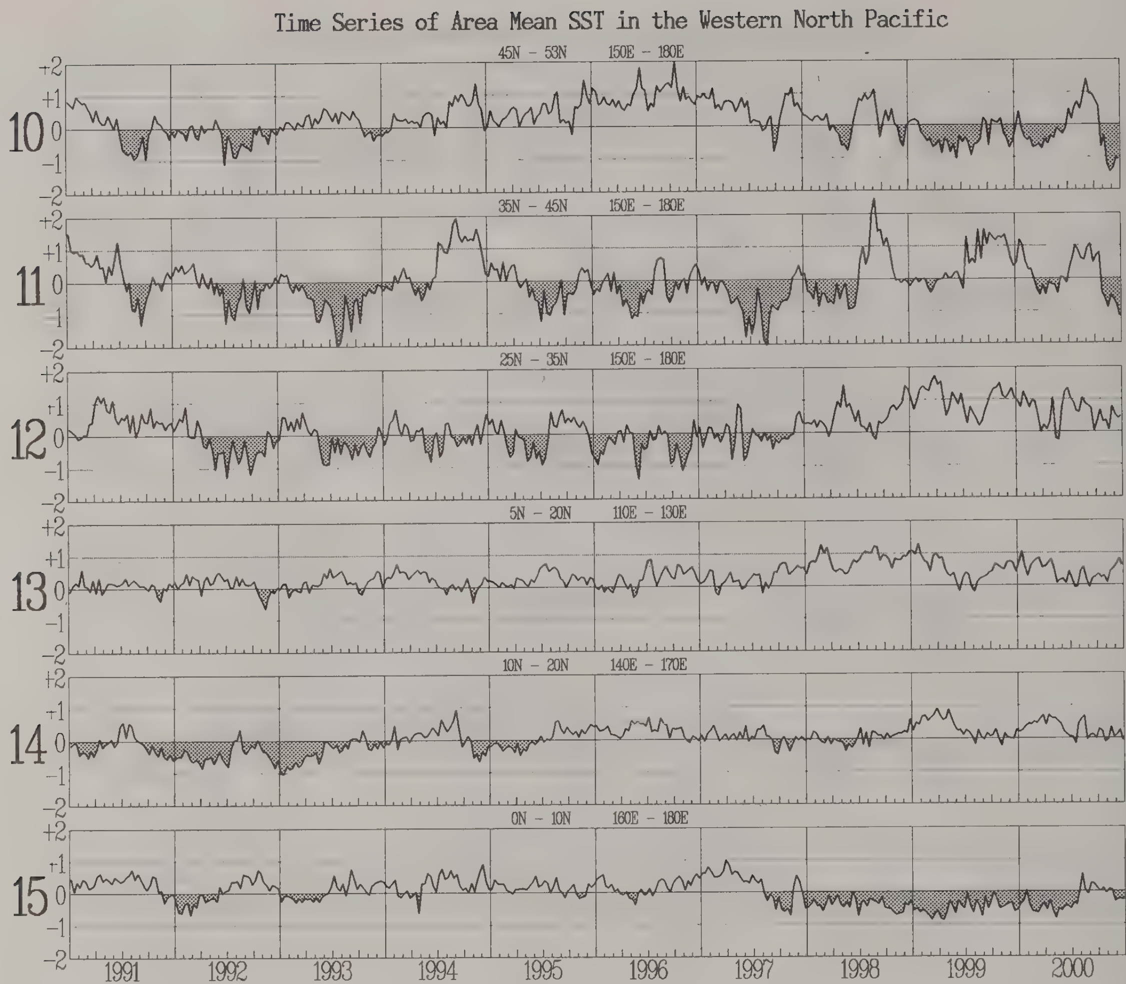
Time Series of Area Mean SST in the Western North Pacific





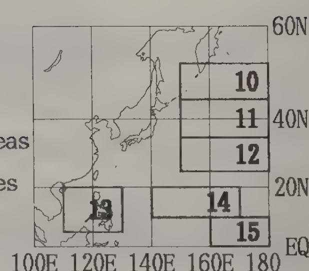
第12図　海域別旬平均海面水温平年偏差時系列図

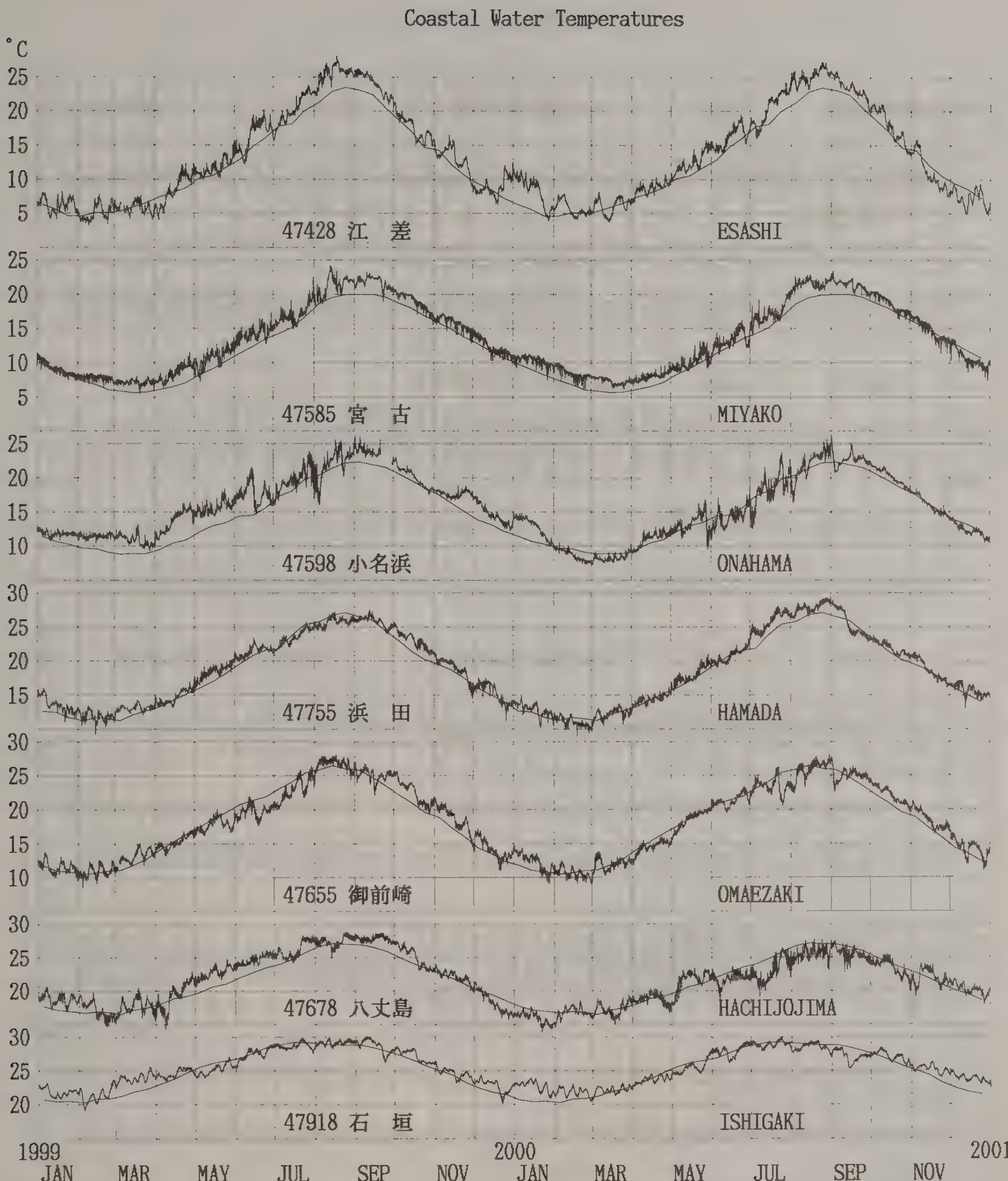
Fig.12 Time series of the ten-day mean sea surface temperature anomalies (°C) in the western North Pacific for the areas shown in the right panel. Negative anomalies are shaded. Anomalies are computed from the JMA climatology (1961-90).

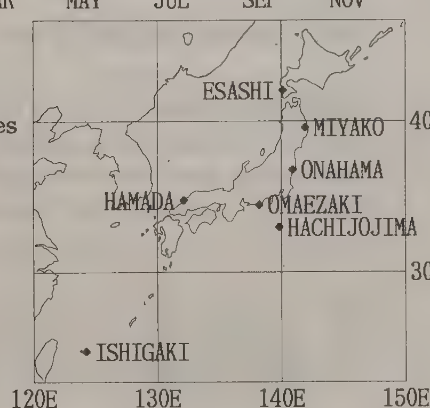


第12図　海域別旬平均海面水温平年偏差時系列図（つづき）

Fig.12 (continue) Time series of the ten-day mean sea surface temperature anomalies (°C) in the western North Pacific for the areas shown in the right panel. Negative anomalies are shaded. Anomalies are computed from the JMA climatology (1961-90).



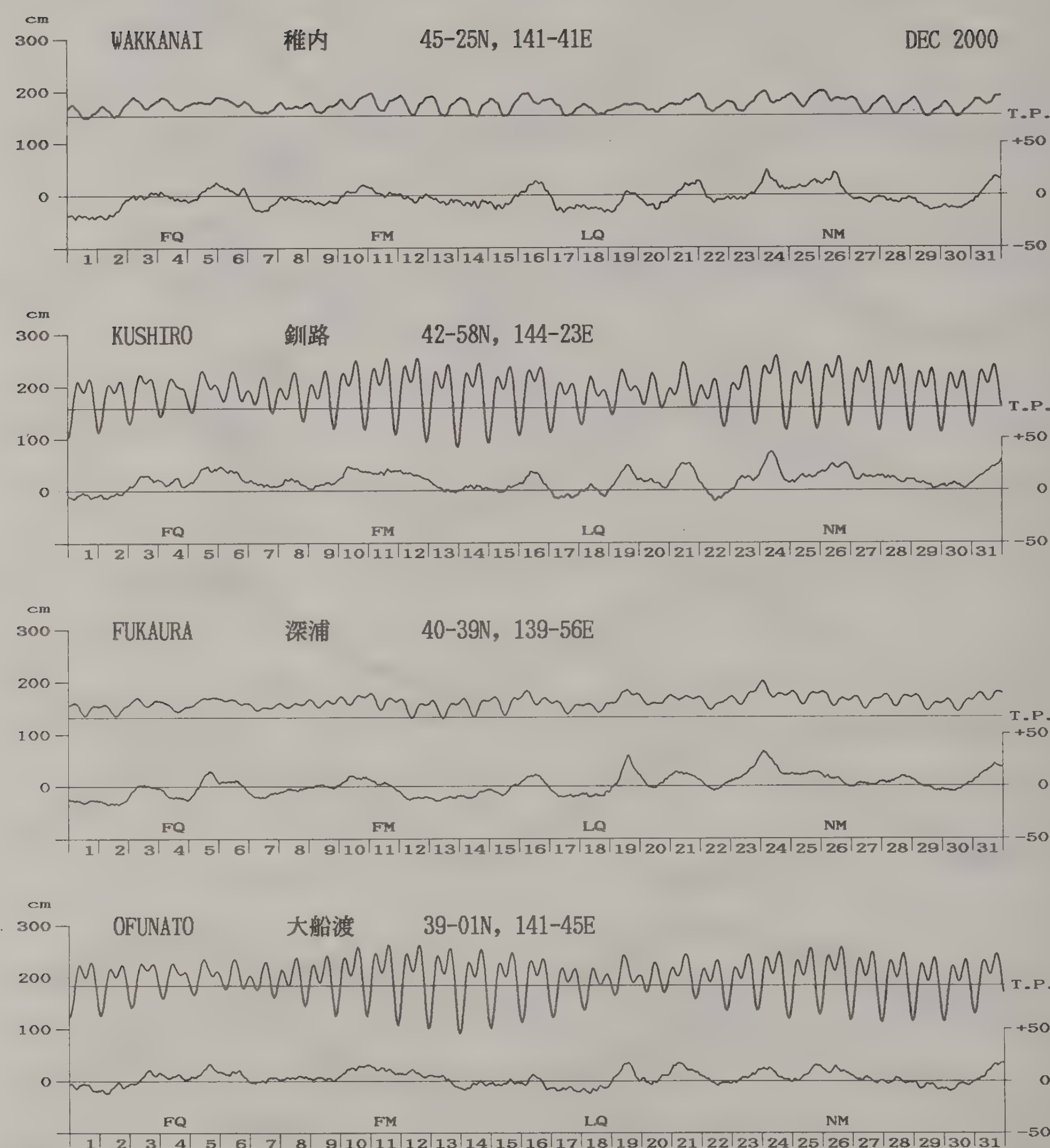




第13図 沿岸水温時系列図

Fig.13 Time series of hourly coastal water temperatures (°C) measured at 7 coastal stations of the JMA shown in the right panel.
Thin lines show ten-day mean climatology.

Time Series of Sea Level



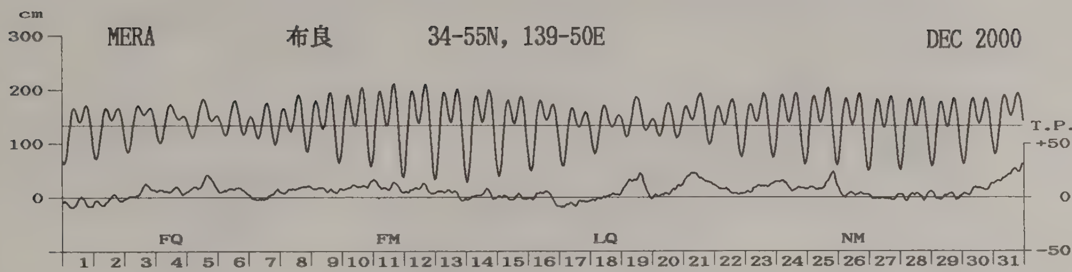
第14図 沿岸潮位時系列図（2000年12月）

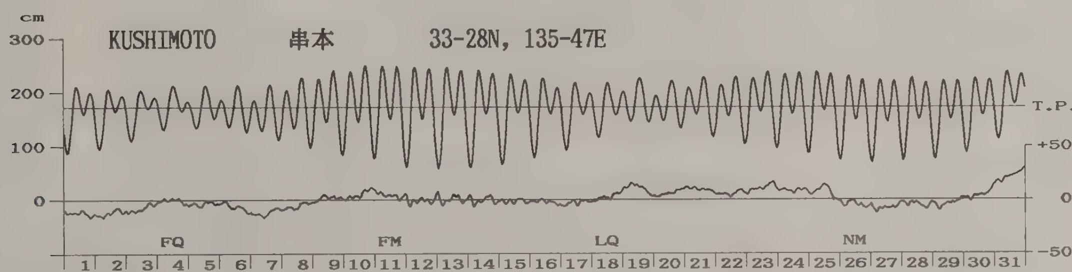
Fig.14 Time series of hourly sea level observation (upper line) and its anomalies (lower line) at 9 stations of the JMA in the right panel.
Short term variations are removed from raw data.

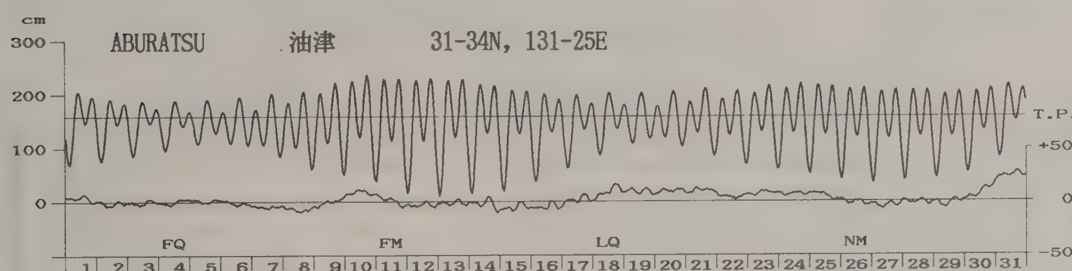


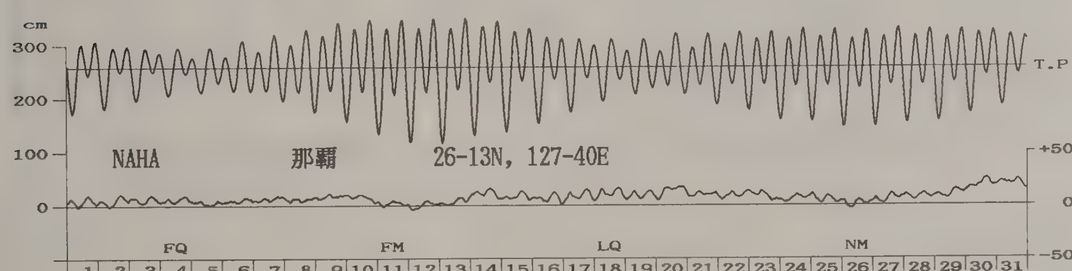
NM: new moon, FQ: first quarter
FM: full moon, LQ: last quarter
T.P.: Mean sea level of Tokyo Bay (Tokyo Peil)

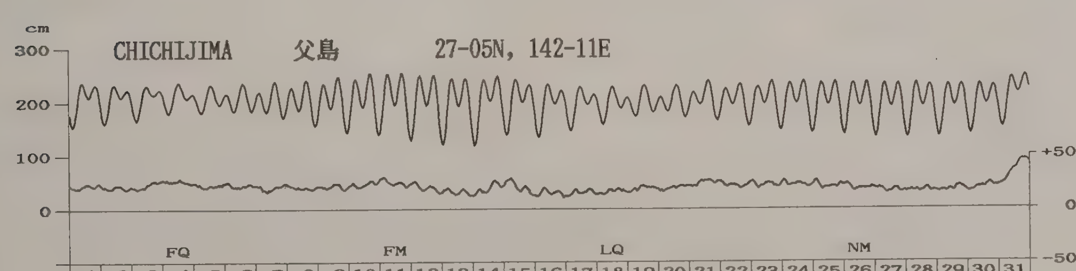
Time series of Sea Level



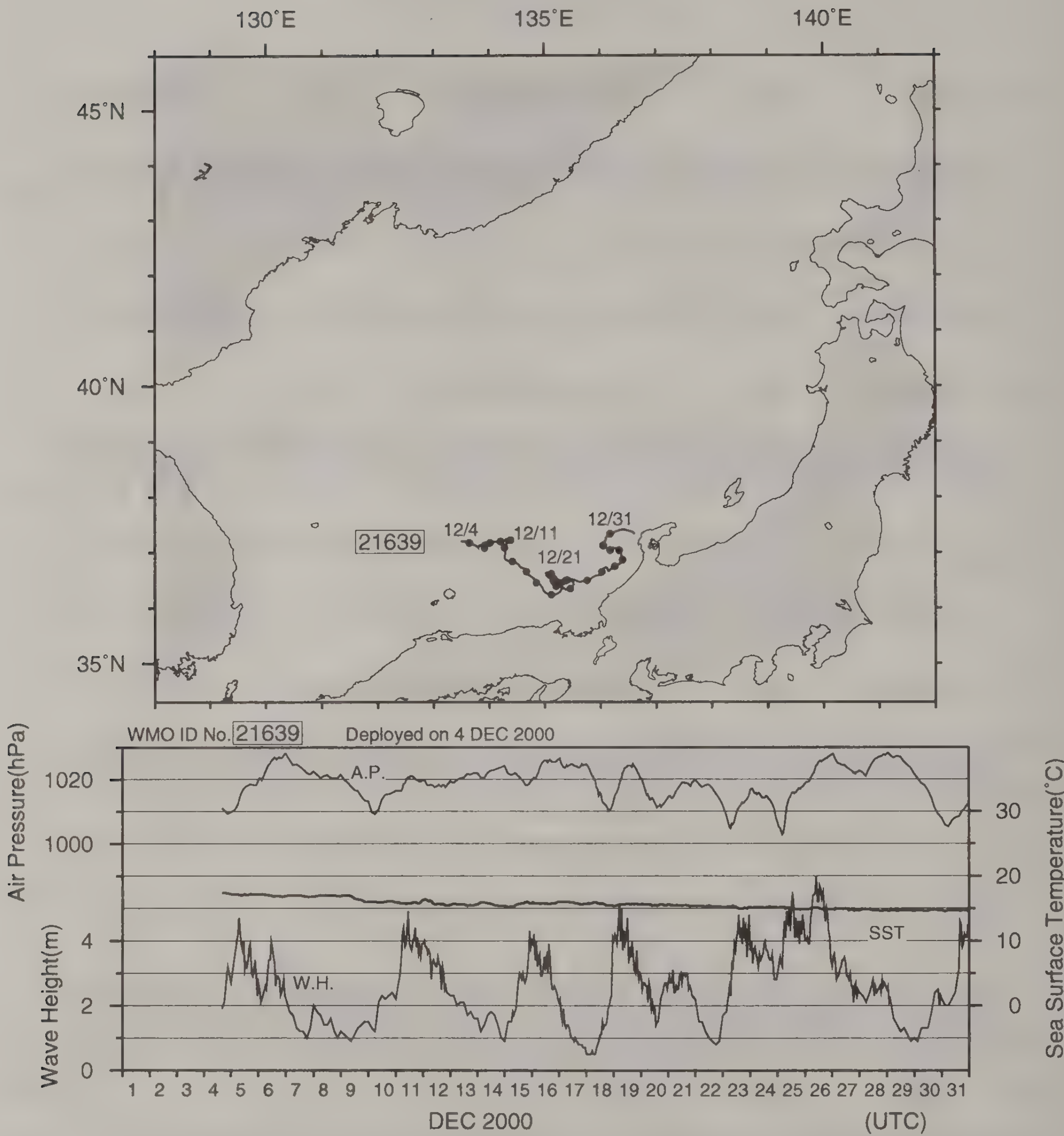






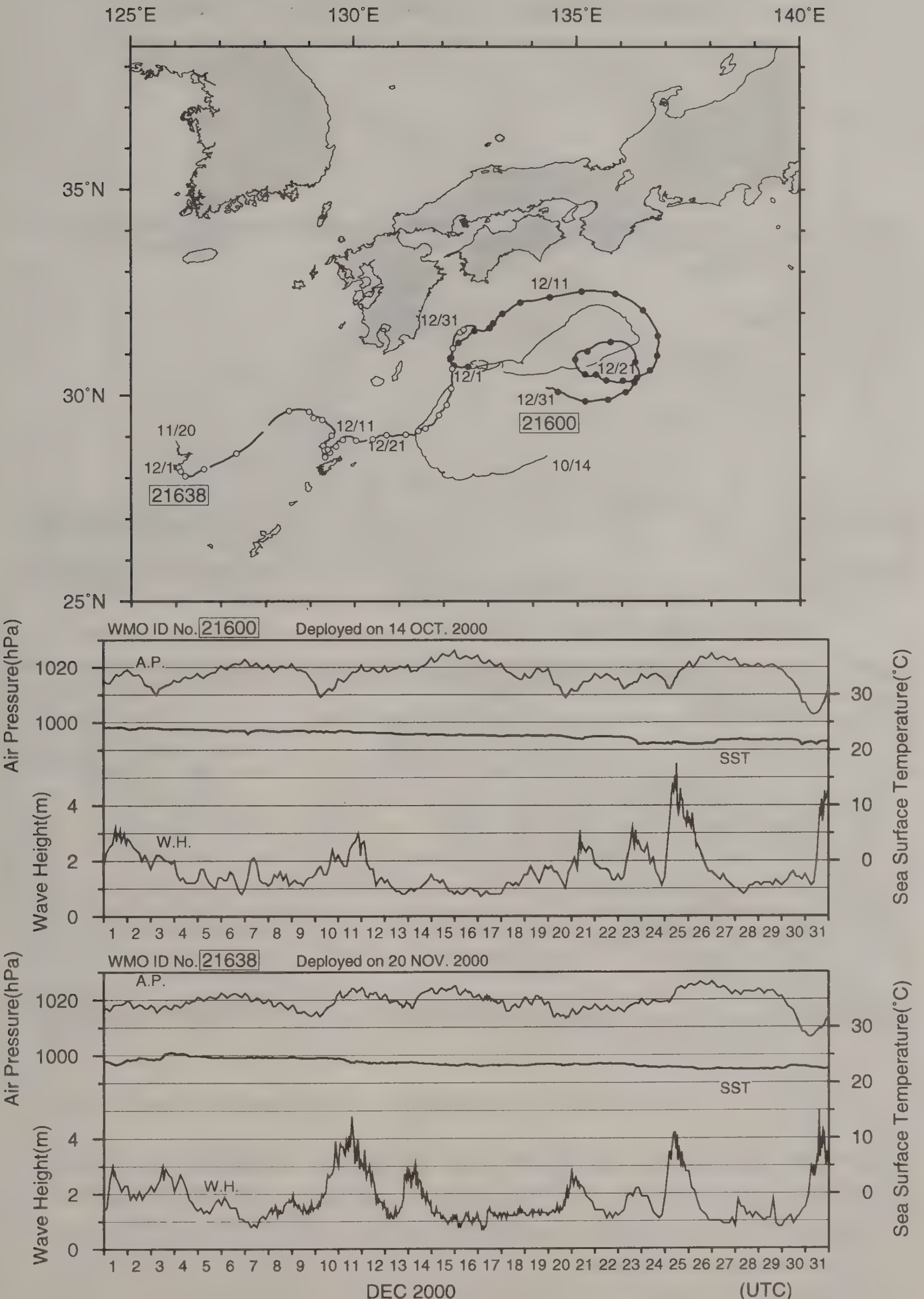


第14図 つづき
Fig.14 continue



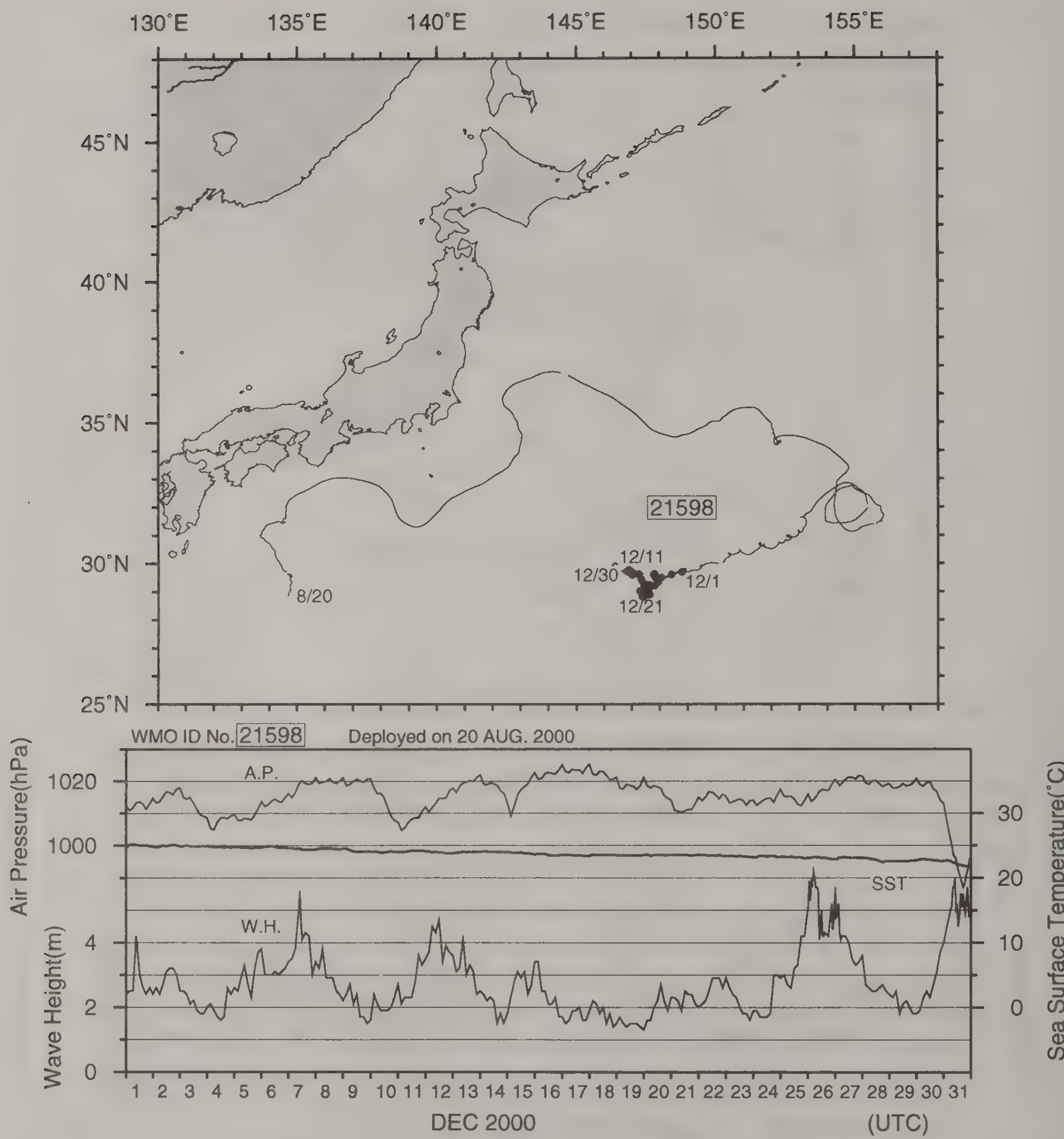
第15-1図　漂流型海洋気象ブイロボットの軌跡と観測要素の時系列図（日本海）

Fig.15-1　Time series of JMA drifting buoy observation in the Japan Sea.
The upper panel shows paths of the buoys. Circles denote the position at 00h UTC everyday.
The lower panel shows time series of observation data.



第15-2図　漂流型海洋気象ブイロボットの軌跡と観測要素の時系列図

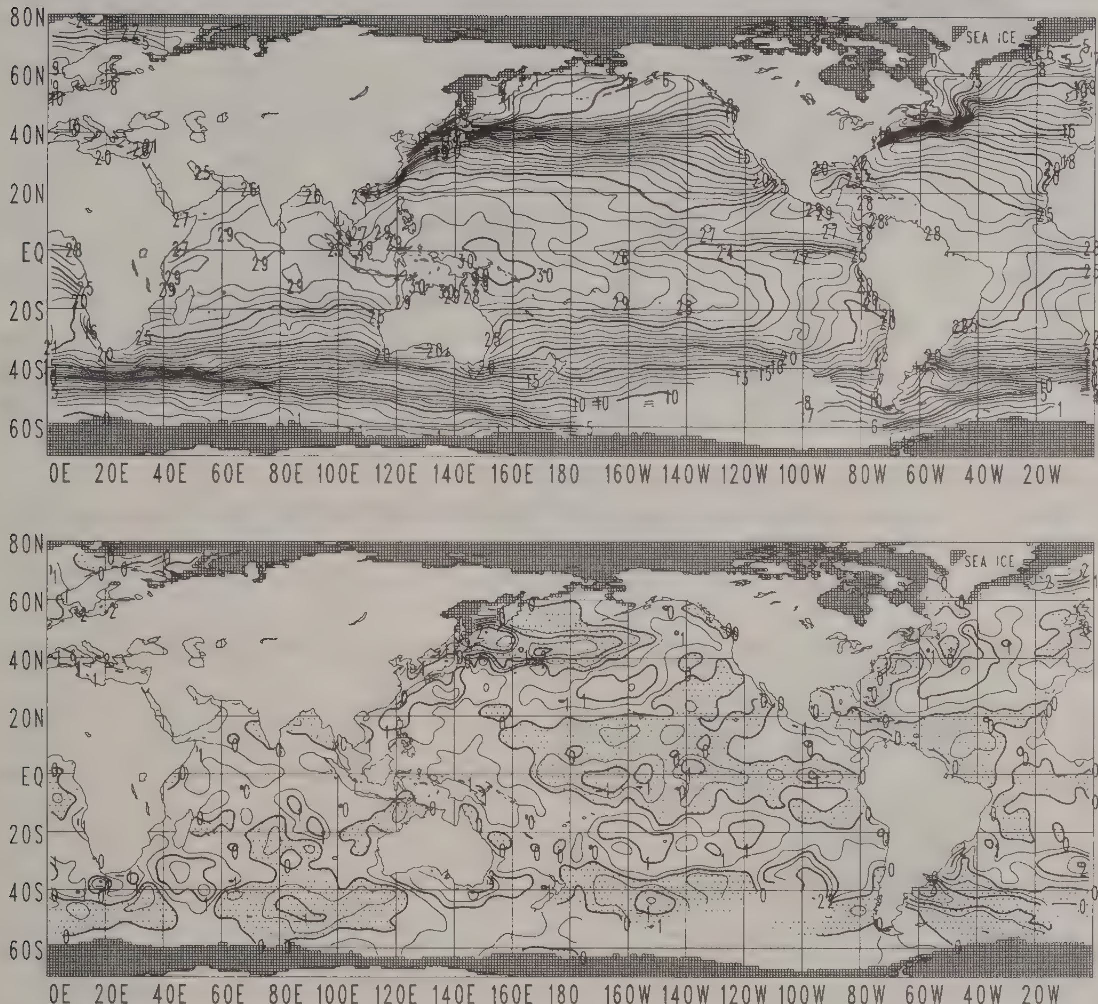
Fig.15-2　Time series of JMA drifting buoy observation.
The upper panel shows paths of the buoys. Circles denote the position at 00h UTC everyday.
The lower panel shows time series of observation data.



第15-3図　漂流型海洋気象ブイロボットの軌跡と観測要素の時系列図

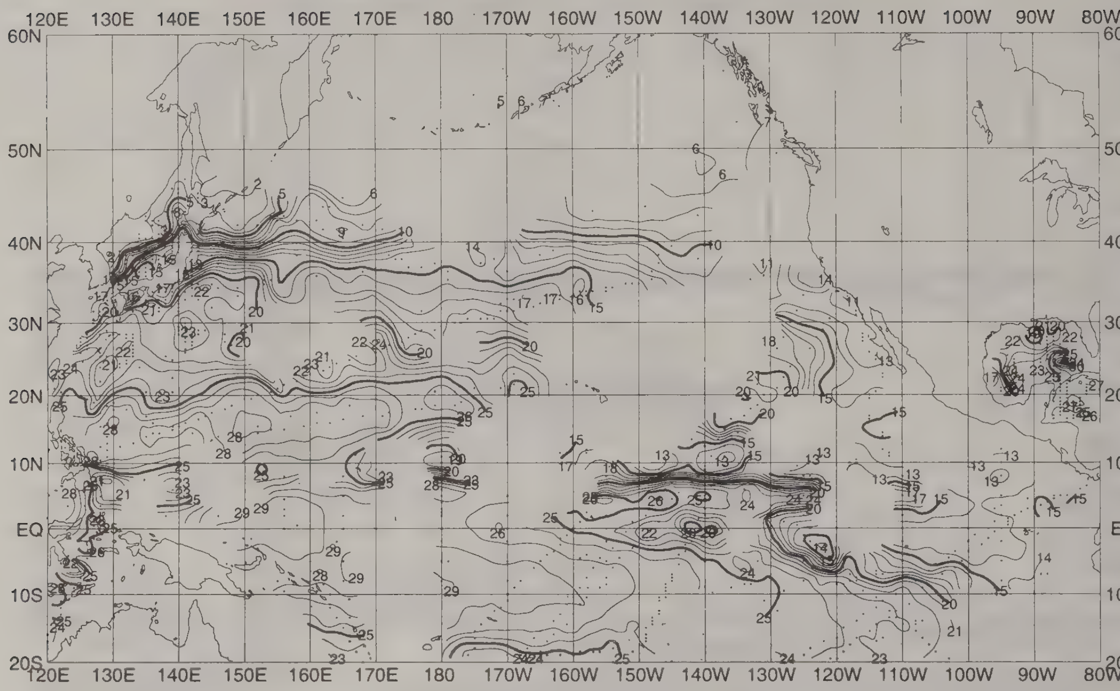
Fig.15-3　Time series of JMA drifting buoy observation.
The upper panel shows paths of the buoys. Circles denote the position at 00h UTC everyday.
The lower panel shows time series of observation data.

SST & Anomalies in the Global Ocean



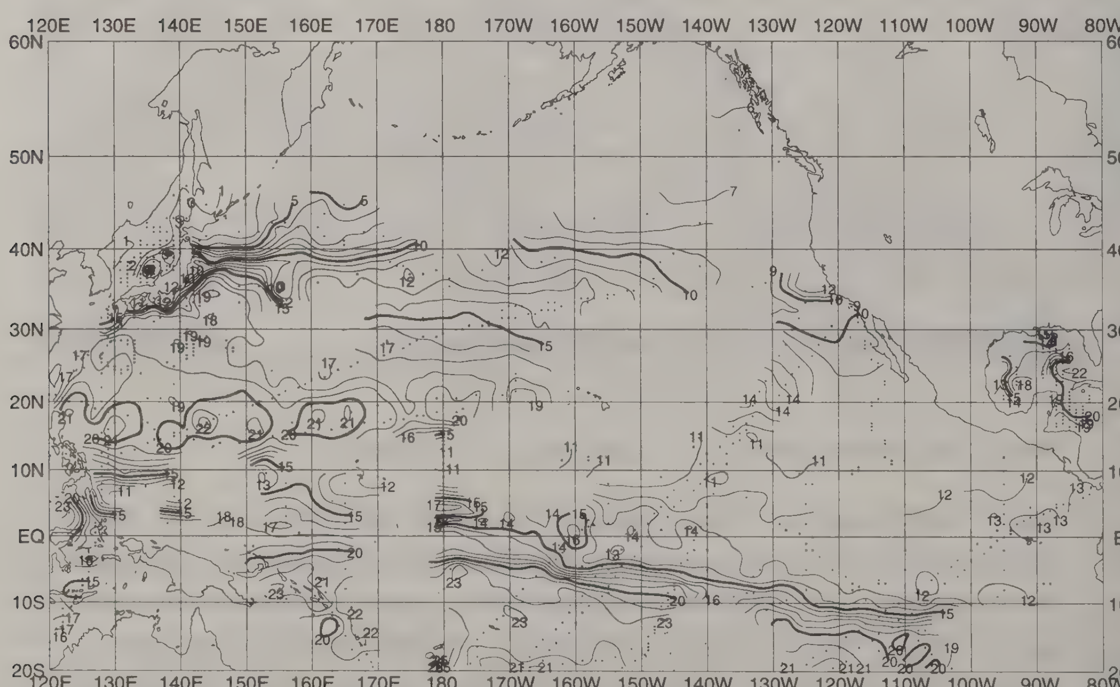
第16図　全球月平均海面水温図（上）及び偏差図（下）（2000年12月）

Fig.16 Monthly mean sea surface temperature over the global ocean (top) and anomalies (bottom) for DEC 2000. Anomalies are computed from the JMA climatology (1961-1990). Contour interval is 1°C (top) and additional anomaly contours of ±0.5°C are shown by thin lines. Negative anomalies are spotted. Maximum coverage of sea ice is shaded. Data sources for sea ice are U.S. National Ice Center (polar regions) and JMA (the Sea of Okhotsk).



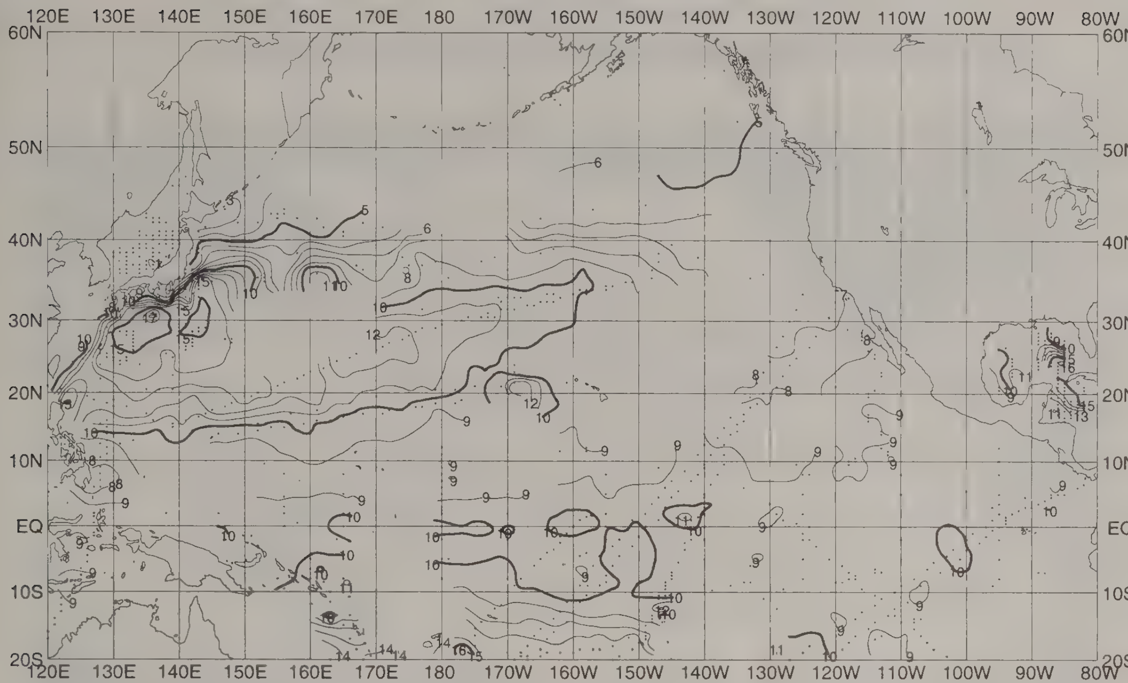
第 17 図　太平洋表層水温図（深さ 100 m）　(2000 年 12 月)

Fig. 17　Subsurface (100 m) temperatures in the Pacific Ocean for December 2000. Contour interval is 1 ℃. Observation points are denoted by dots.



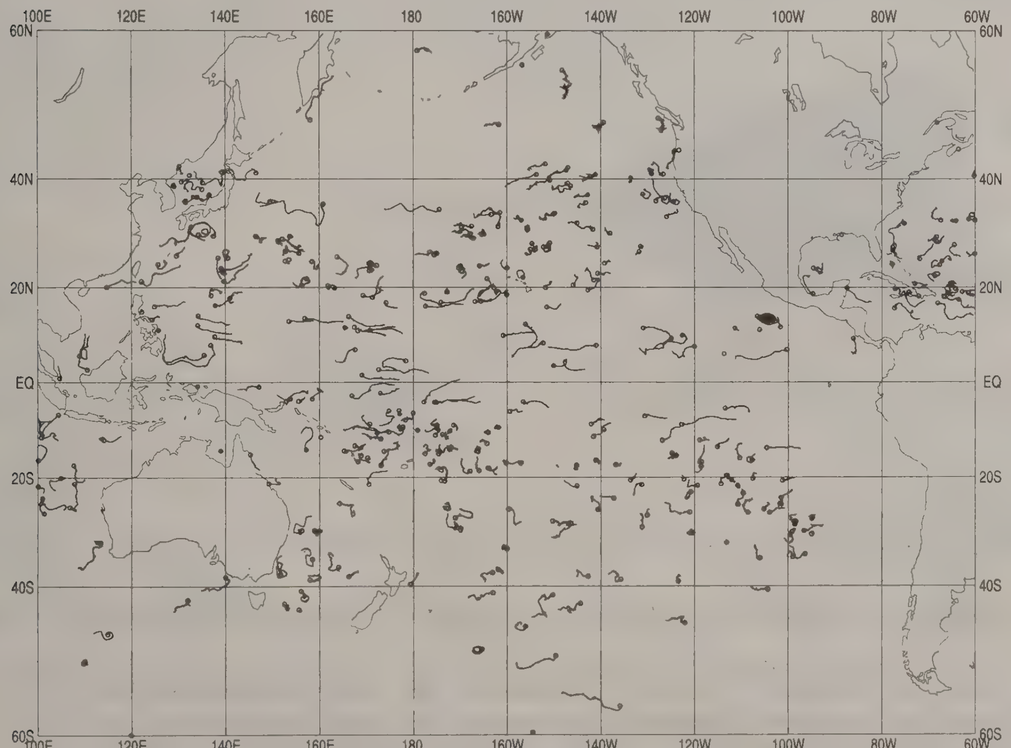
第 18 図　太平洋表層水温図（深さ 200 m）　(2000 年 12 月)

Fig. 18　Subsurface (200 m) temperatures in the Pacific Ocean for December 2000. Contour interval is 1 ℃. Observation points are denoted by dots.



第 19 図　太平洋表層水温図（深さ 400 m）（2000 年 12 月）

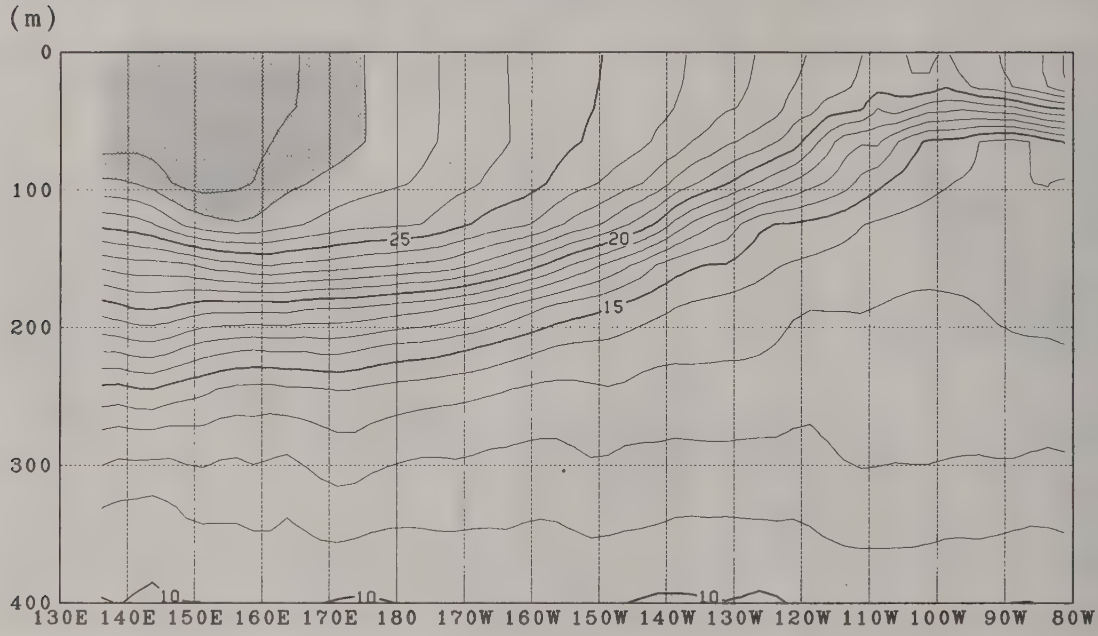
Fig. 19　Subsurface (400 m) temperatures in the Pacific Ocean for December 2000. Contour interval is 1 ℃. Observation points are denoted by dots.

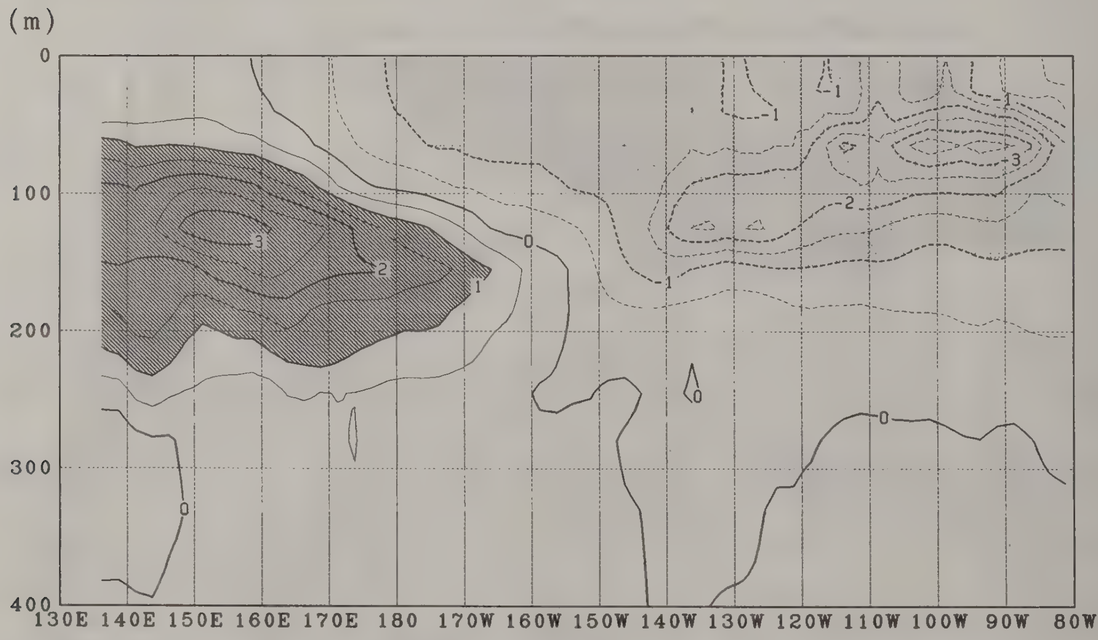


第 20 図　太平洋ブイ流跡図（2000 年 12 月）

Fig. 20　Movements of drifting buoys in the Pacific Ocean during December 2000. Each track is for one buoy. Small circles represent the last positions for the month.

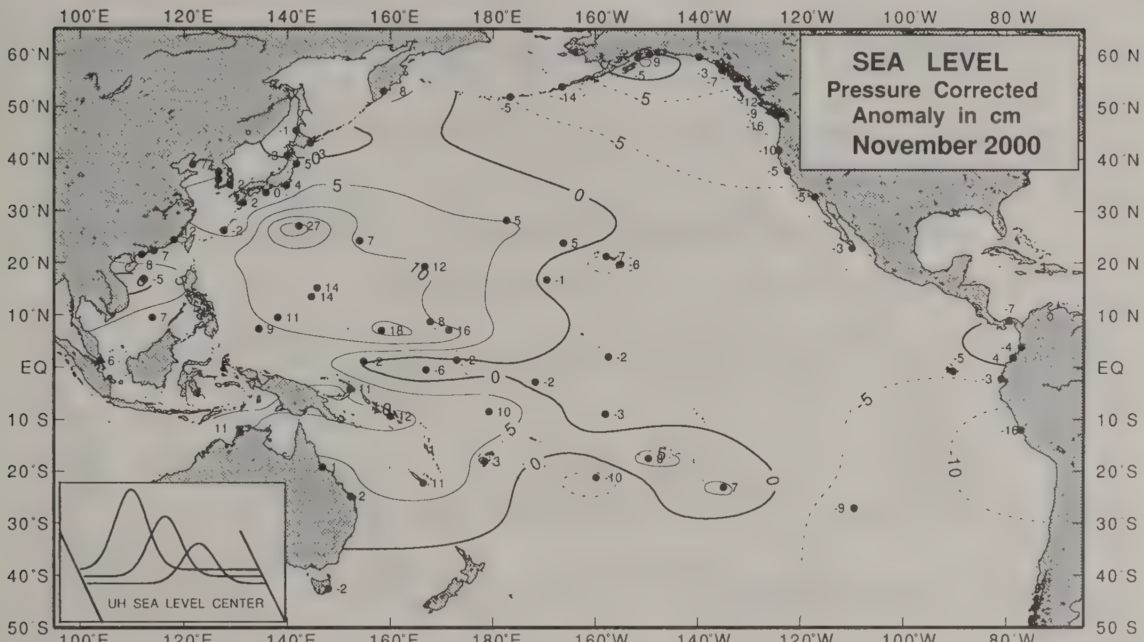
Depth-Longitude Sections of Equatorial Temperature & Anomalies





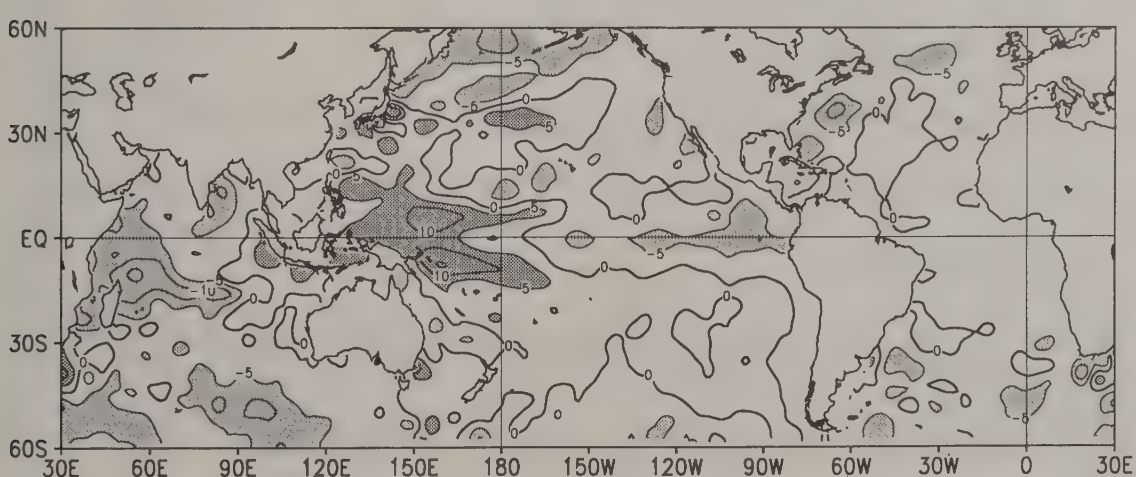
第21図　太平洋赤道に沿う表層水温（上）及び偏差（下）の深度－経度断面図（2000年12月）

Fig.21 Depth-longitude sections of temperature (top) and anomalies (bottom) along the equator in the Pacific Ocean for DEC 2000. Data are derived from the Ocean Data Assimilation System of JMA. Contour interval is 1°C (top) and 0.5°C (bottom). Values greater than 28°C in the top panel are shaded. In the bottom panel, values greater than 1°C are shaded and values less than -1°C are spotted. Anomalies are computed from 1987-1999 base period means.



第 22 図　太平洋月平均海面水位偏差図 （2000 年 11 月）

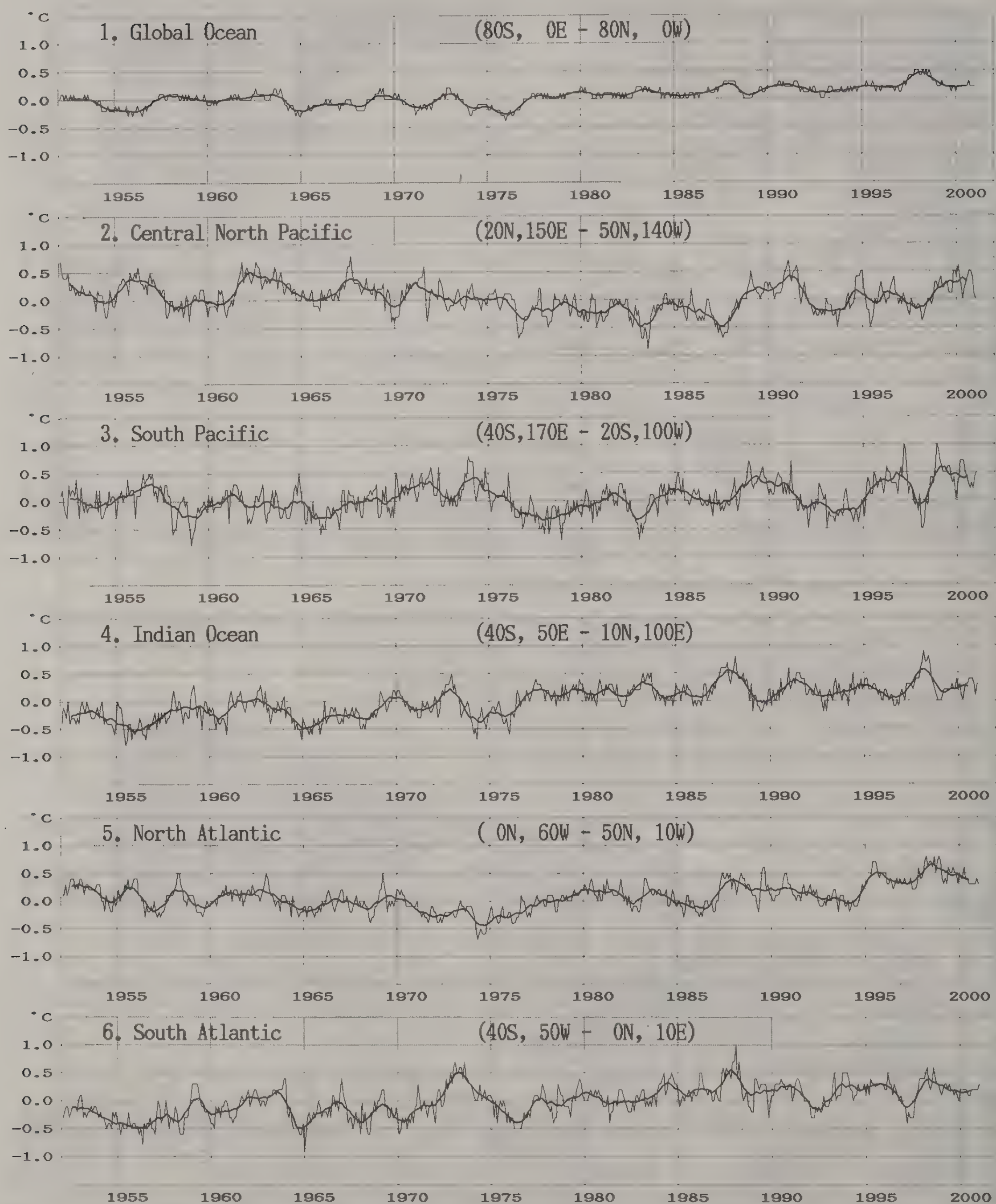
Fig. 22　Monthly sea level anomalies for November 2000 obtained from mean sea level (1975-1995) adjusted for atmospheric pressure. This figure is prepared by the SOC of ISLP-PAC, Department of Oceanography, University of Hawaii.



第 23 図　全球月平均海面高度偏差図 （2000 年 11 月）

Fig. 23　Monthly sea surface height anomalies in the global ocean derived from the altimeter data of TOPEX/POSEIDON for November 2000. Contour interval is 5 cm. Positive anomalies exceeding +5 cm are shaded and negative anomalies exceeding -5 cm are spotted. Anomalies are computed from 1993-1998 base period means.

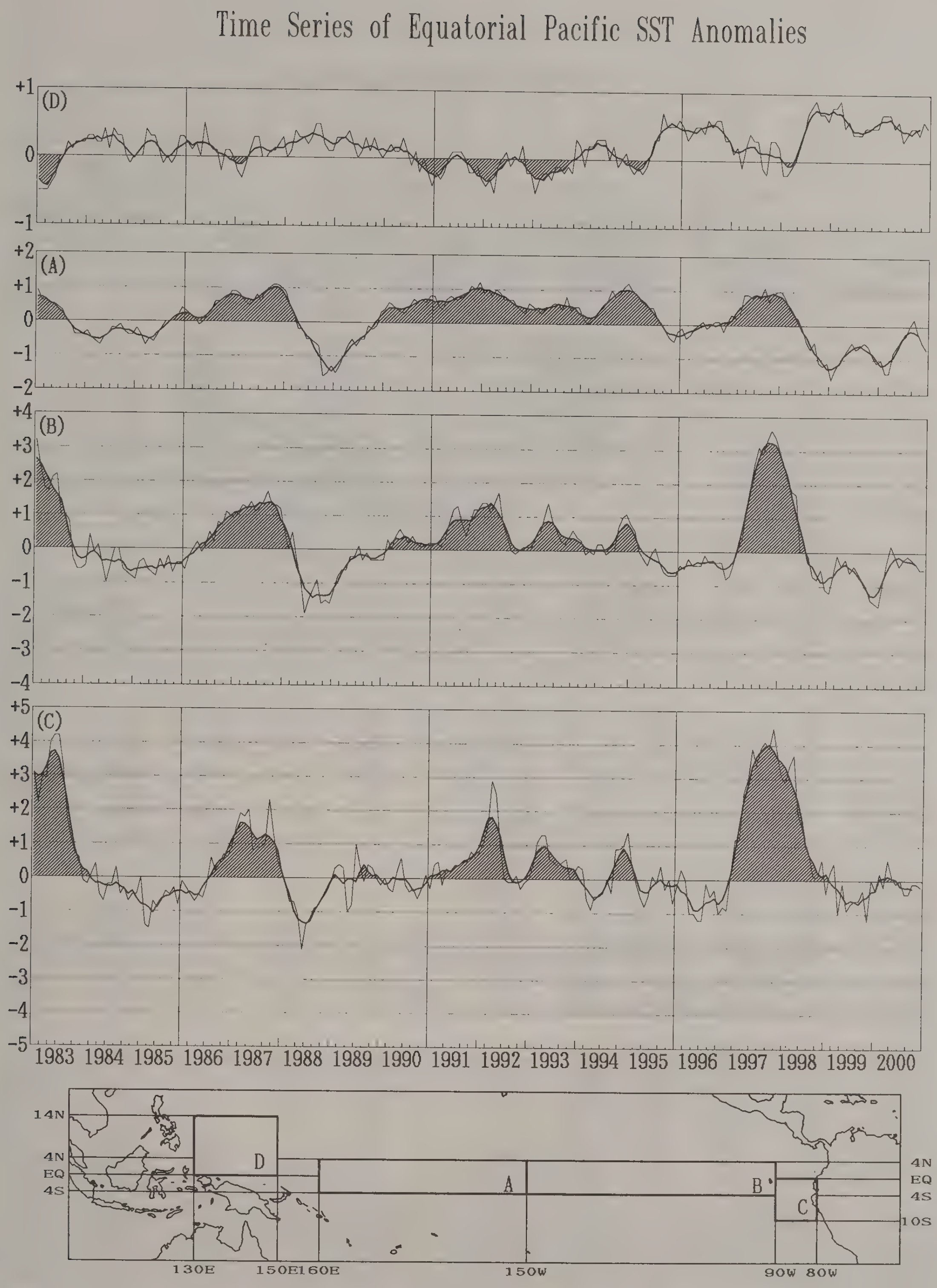
Long-term Variation of Monthly Mean SST Anomalies



第24図 海域平均海面水温偏差の長期変動

Fig.24 Long-term variations of monthly mean sea surface temperature anomalies (°C) for the areas shown in the right panel. Anomalies are computed from the JMA climatology (1961-90). Thin lines show the monthly mean and thick lines their 13-month running means.





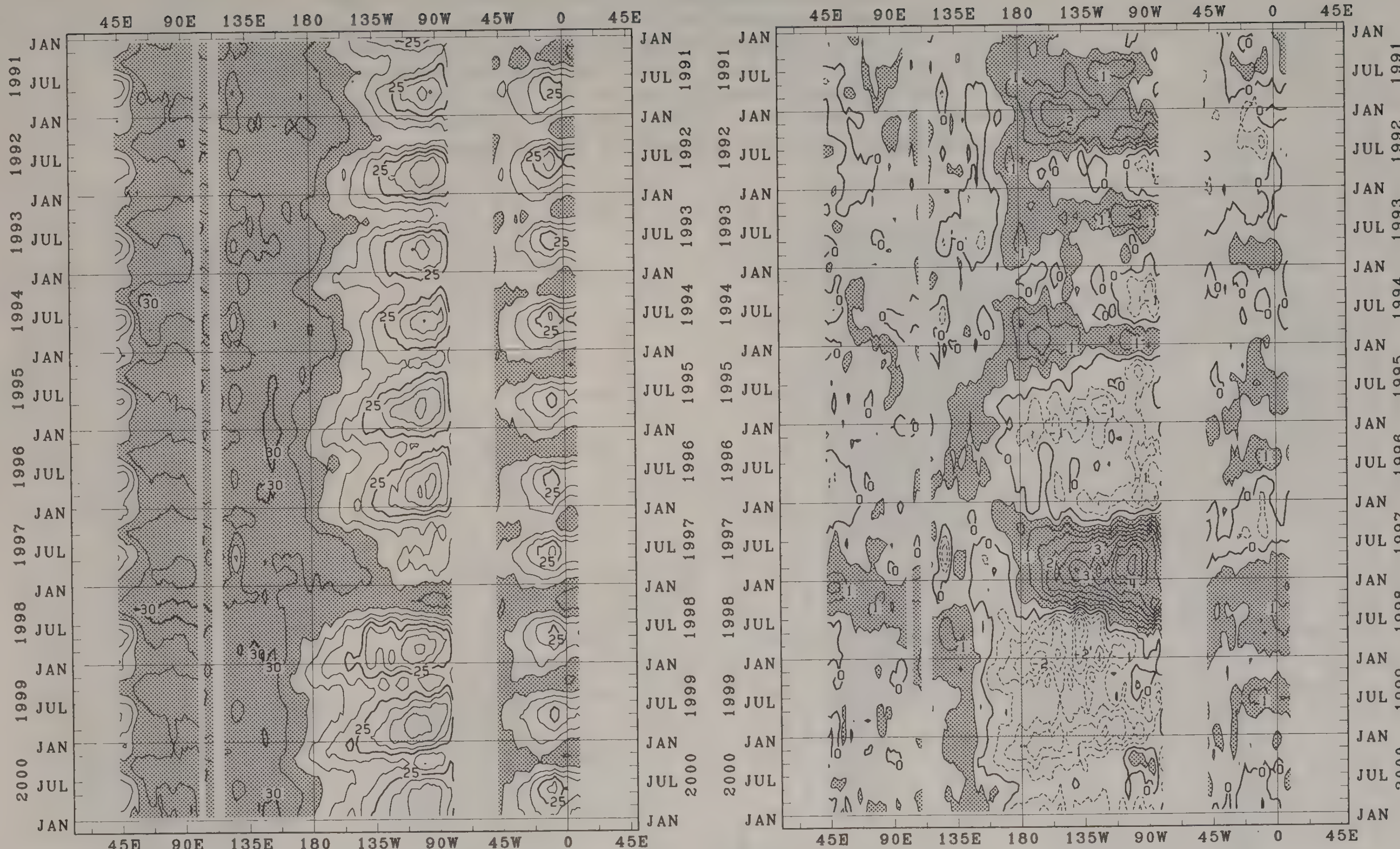
第25図　太平洋赤道域の海面水温偏差時系列図

Fig.25 Time series of monthly mean SST anomalies (°C) in the equatorial Pacific Ocean for the areas indicated at the bottom panel. Thin lines show the monthly means and thick lines their 5-month running means. Positive anomalies (A, B, C) and negative anomalies (D) are shaded. Anomalies are computed from the JMA climatology (1961-1990).

MONTH YEAR	SEA SURFACE TEMPERATURE AND ANOMALY (°C) REGION D 14N-EQ 130E-150E		REGION A 4N-4S 160E-150W		REGION B 4N-4S 150W-90W		REGION C EQ-10S 90W-80W		SOI	SEA LEVEL PRESSURE ANOMALY (hPa) TAHITI 17-33S 149-37W	DARWIN 12-24S 130-52E
JAN 98	28.3	-0.2	29.0	1.0	28.4	3.0	28.0	3.7	-2.3	-3.6	1.4
FEB 98	28.1	-0.2	28.8	0.8	28.8	2.6	28.8	3.1	-1.8	-0.9	3.5
MAR 98	28.3	-0.1	28.6	0.5	29.0	2.1	28.8	2.9	-2.5	-2.8	2.3
APR 98	28.8	0.0	28.5	0.3	28.9	1.8	28.5	3.4	-2.3	-1.5	1.4
MAY 98	29.3	0.2	28.7	0.2	28.3	1.7	27.6	3.7	0.0	0.4	0.5
JUN 98	29.7	0.4	28.4	-0.1	26.1	0.0	24.7	2.0	1.1	0.9	-0.5
JUL 98	29.9	0.7	28.0	-0.5	25.3	0.1	23.2	1.6	1.5	1.8	-0.6
AUG 98	29.9	0.8	27.7	-0.7	24.5	-0.1	21.7	1.1	1.0	1.4	-0.2
SEP 98	30.1	0.9	27.8	-0.5	23.9	-0.7	21.0	0.7	1.0	1.4	-0.4
OCT 98	30.0	0.7	27.3	-1.1	23.8	-0.8	20.8	0.1	1.2	0.8	-1.1
NOV 98	29.9	0.7	27.2	-1.2	24.1	-0.5	21.6	0.1	1.0	0.4	-1.5
DEC 98	29.5	0.6	27.1	-1.1	23.8	-1.1	23.2	0.6	1.5	1.1	-1.5
JAN 99	29.3	0.8	26.4	-1.6	24.2	-1.2	23.9	-0.4	1.5	1.8	-1.5
FEB 99	29.1	0.8	26.7	-1.3	25.5	-0.7	25.9	0.2	0.8	1.3	-0.6
MAR 99	29.3	0.9	27.0	-1.1	26.8	-0.1	26.4	0.5	0.8	0.4	-1.3
APR 99	29.3	0.5	27.3	-0.9	26.7	-0.4	24.1	-1.0	1.8	1.3	-0.9
MAY 99	29.7	0.6	27.8	-0.7	26.4	-0.2	23.8	-0.1	0.3	1.1	1.1
JUN 99	29.7	0.4	28.0	-0.5	25.5	-0.6	21.8	-0.9	0.1	0.6	0.4
JUL 99	29.6	0.4	27.8	-0.7	24.8	-0.4	20.9	-0.7	0.5	1.0	0.1
AUG 99	29.5	0.4	27.8	-0.6	24.0	-0.6	20.0	-0.6	0.0	1.3	1.1
SEP 99	29.7	0.5	27.8	-0.5	23.8	-0.8	19.7	-0.6	-0.1	0.2	0.4
OCT 99	29.8	0.5	27.8	-0.6	23.6	-1.0	20.4	-0.3	1.1	1.2	-0.4
NOV 99	29.7	0.5	27.5	-0.9	23.2	-1.4	20.3	-1.2	1.1	1.2	-0.9
DEC 99	29.4	0.5	27.1	-1.1	23.4	-1.5	22.6	0.0	1.5	1.9	-0.9
JAN 00	29.2	0.7	27.0	-1.0	23.8	-1.6	24.0	-0.3	0.4	1.3	0.3
FEB 00	29.0	0.7	26.6	-1.4	25.3	-0.9	25.9	0.2	1.1	2.6	-0.2
MAR 00	29.1	0.7	26.7	-1.4	26.6	-0.3	25.7	-0.2	1.0	1.6	-0.3
APR 00	29.3	0.5	27.4	-0.8	27.3	0.2	25.7	0.6	1.4	0.8	-1.0
MAY 00	29.7	0.6	27.9	-0.6	26.5	-0.1	24.0	0.1	0.3	0.8	0.7
JUN 00	29.6	0.3	28.1	-0.4	25.7	-0.4	22.6	-0.1	-0.6	0.2	0.9
JUL 00	29.6	0.4	28.2	-0.3	25.0	-0.2	21.6	0.0	-0.3	-0.4	0.0
AUG 00	29.6	0.5	28.4	0.0	24.5	-0.1	20.2	-0.4	0.5	0.2	-0.6
SEP 00	29.7	0.5	28.5	0.2	24.4	-0.2	19.9	-0.4	0.9	1.6	-0.0
OCT 00	29.7	0.4	28.2	-0.2	24.3	-0.3	20.6	-0.1	0.9	0.2	-1.5
NOV 00	29.8	0.6	27.9	-0.5	24.1	-0.5	21.4	-0.1	1.9	1.2	-2.4
DEC 00	29.4	0.5	27.5	-0.7	24.4	-0.5	22.4	-0.2	0.9	-1.0	-2.7

第1表　エルニーニョ監視指数

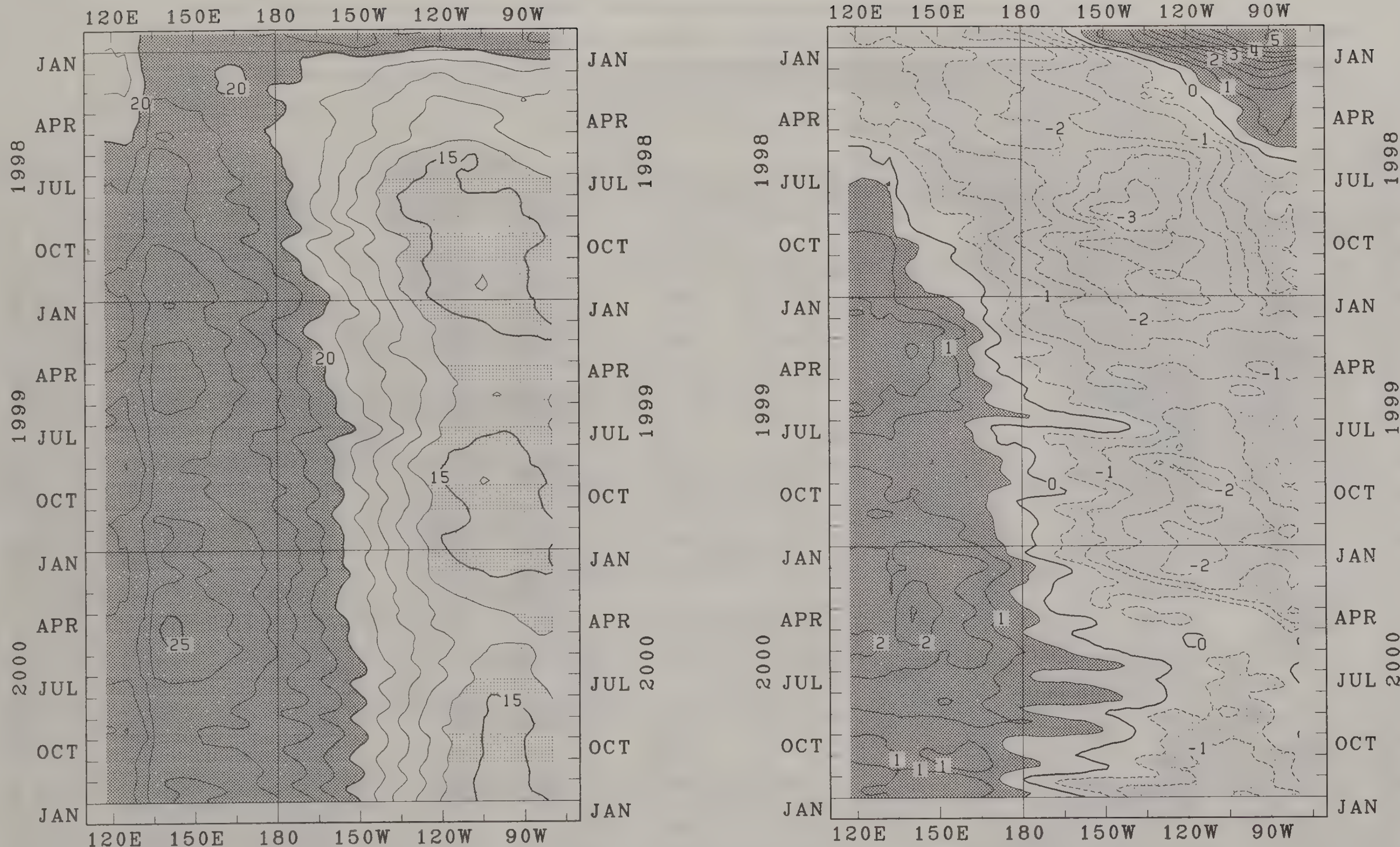
Table 1 El Nino Monitoring indices



第 26 図　赤道に沿った海面水温（左）及び偏差（右）の時間-経度断面図

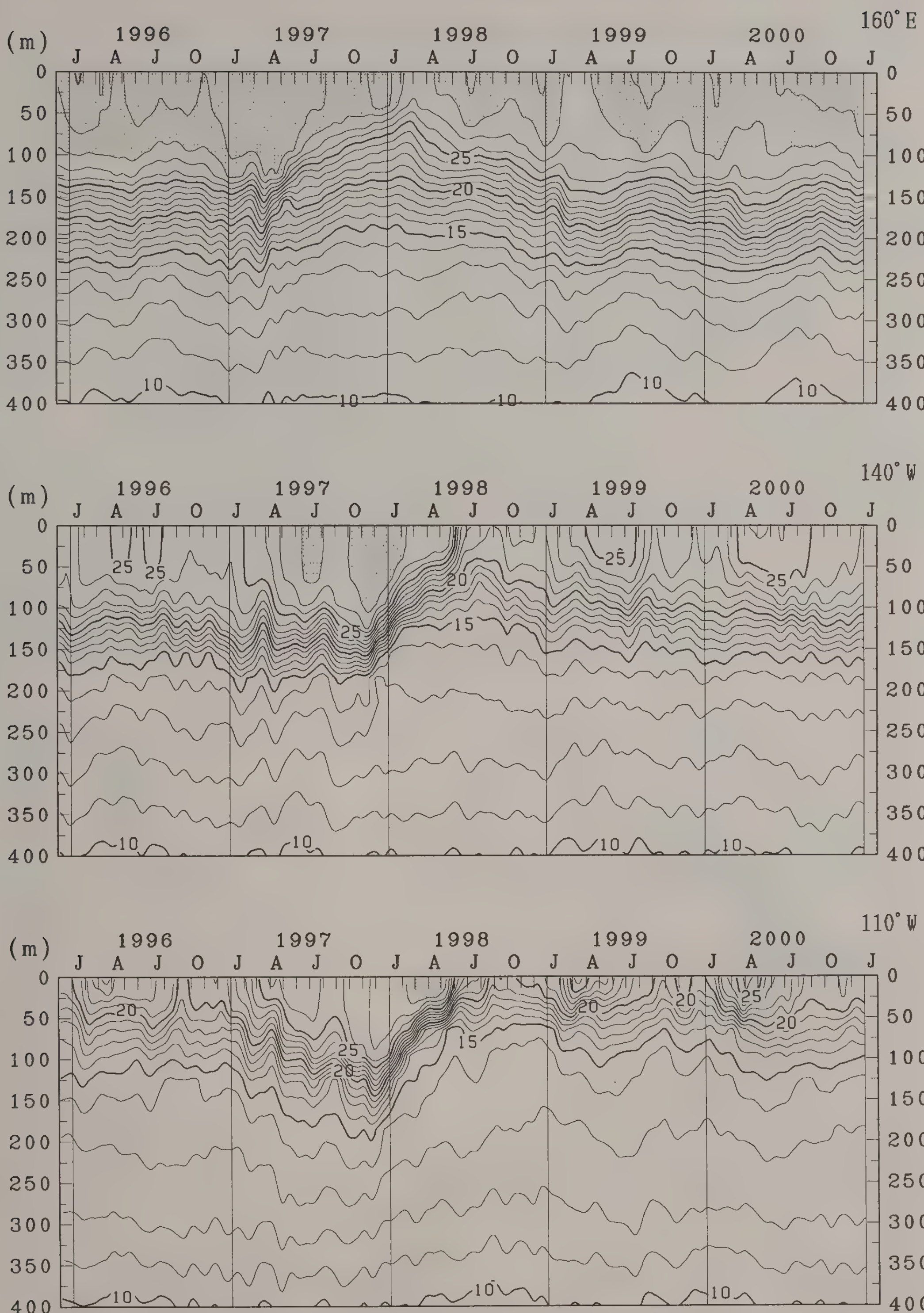
Fig. 26　Time-longitude sections of SSTs (left) and anomalies (right) along the equator (2 °N-2 °S) in the global ocean. Contour interval is 1 ℃ (left) and 0.5 ℃ (right). Values greater than 28 ℃ are shaded and values less than 23 ℃ are spotted in the left panel. Dashed contours indicate negative anomalies in the right panel. Anomalies are computed from 1961-1990 base period means.

Time-Longitude Sections of Ocean Heat Content & Anomalies (Eq.)



第27図　太平洋の赤道に沿う海洋表層の貯熱量（左）及び偏差（右）の時間－経度断面図

Fig.27 Time-longitude sections of ocean heat content in the upper 260 m along the equator (left) and anomalies (right) in the Pacific Ocean. Data are derived from the Ocean Data Assimilation System of JMA. Contour interval is 1°C (left) and 0.5°C (right). Values greater than 20°C are shaded and values less than 16°C are spotted in the left panel. Dashed contours indicate negative anomalies in the right panel. Anomalies are computed from 1987-1999 base period means.



第28図　太平洋赤道域の表層水温の時間－深度断面図
(上：西部、中：中部、下：東部)

Fig.28 Time-depth sections of equatorial subsurface temperature for the western Pacific (top, 160°E), the central Pacific (middle, 140°W) and the eastern Pacific (bottom, 110°W). Data are derived from the Ocean Data Assimilation System of JMA. Contour interval is 1°C. Values greater than 28°C are shaded.

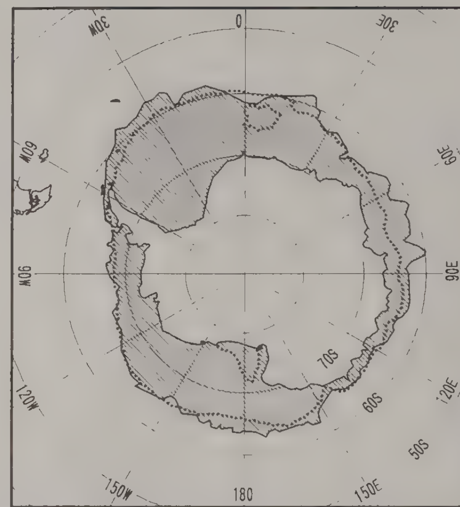


第29-1図　北極域の海氷図（2000年12月14日）

Fig.29-1 Sea ice chart in the Arctic on 14 Dec. 2000.

The shaded area represents the sea ice extent. The dotted line denotes the mean ice edge averaged for the period from 1972 through 1990.

The data source is the National Ice Center (USA).

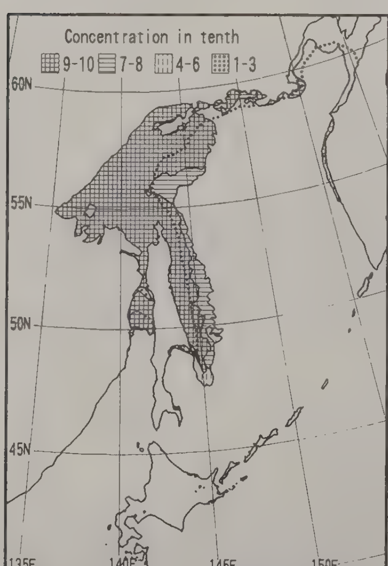


第29-2図　南極域の海氷図（2000年12月15日）

Fig.29-2 Sea ice chart in the Antarctic on 15 Dec. 2000.

The shaded area represents the sea ice extent. The dotted line denotes the mean ice edge averaged for the period from 1973 through 1990.

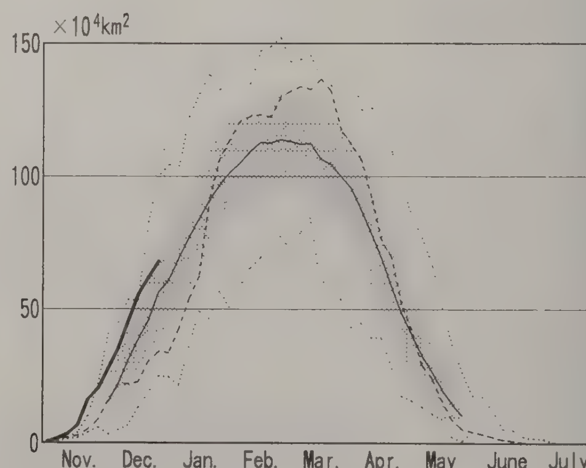
The data source is the National Ice Center (USA).



第29-3図 オホーツク海の海氷図（2000年12月15日）

Fig.29-3 Sea ice chart in the Sea of Okhotsk on 15 Dec. 2000.

The dotted line denotes the mean ice edge averaged for the period from 1971 through 1995.



第29-4図 オホーツク海の海氷域面積

Fig.29-4 Time-series of 5-day sea ice extent in the Sea of Okhotsk.

: current season (2000/2001)

: mean extent (1971–2000)

: maximum or minimum extent (1971–2000)

: last season (1999/2000)

: mean $\pm 1\sigma$ (1971–2000)

トカラ海峡で黒潮が消失？
Kuroshio disappeared at the Tokara Strait?

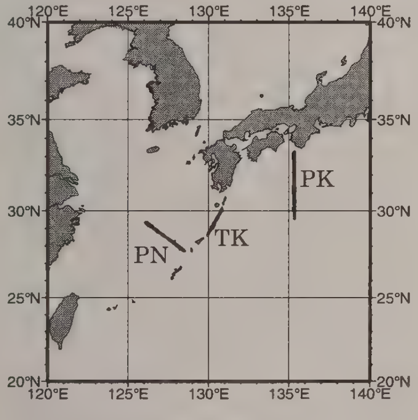
長崎海洋気象台「長風丸」による2000年1月と4月の観測で、TK線（第30図A）における黒潮の地衡流量が1987～2000年の平均値16.6Svと比べて極めて少なく、5Sv前後であった。TK線の水温断面図（第30図C）でも、例年は1999年1月のように南側が高温、北側が低温の右下がりの水温勾配となるが、2000年1月はTK-6～9の300～500m深で右上がりの水温勾配となっている。

黒潮の流路としてTK線の上流にあたるPN線及び下流にあたるPK線（神戸海洋気象台「春風丸」の観測による）の黒潮の地衡流量（第30図B）は、ともに平年並の値である。

TK線の流量は、その後の7月と10月の観測では15Sv前後まで回復した。

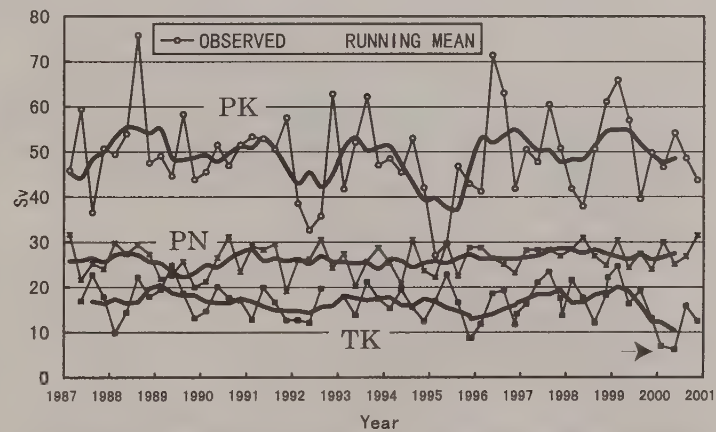
R/V Chofu Maru of the Nagasaki Marine Observatory, JMA has been routinely making oceanographic observation along the fixed lines in the East China Sea(PN line) and at the Tokara Strait(TK line) in every season(Fig.30A). The geostrophic transports at the TK line in January and April 2000 was extremely small: around 5 Sv while the average for the period from 1987 to 2000 is 16.6 Sv(Fig.30B). The water temperature section of the TK line in January 2000 indicated the gradient as warm at north and cold at south(Fig.30C, left) while as usual, for example in January 1999, warm at south and cold at north(Fig.30C, right).

In contrast, the geostrophic transports in the same months of the upstream(PN line) and downstream(PK line: observed by R/V Shumpu Maru of the Kobe Marine Observatory, JMA) lines of the Kuroshio were almost near normal(Fig.30B). The Kuroshio seemed to disappear at the Tokara Strait in January and April 2000. The geostrophic transports at the TK line have recovered to around 15 Sv in July and October 2000.



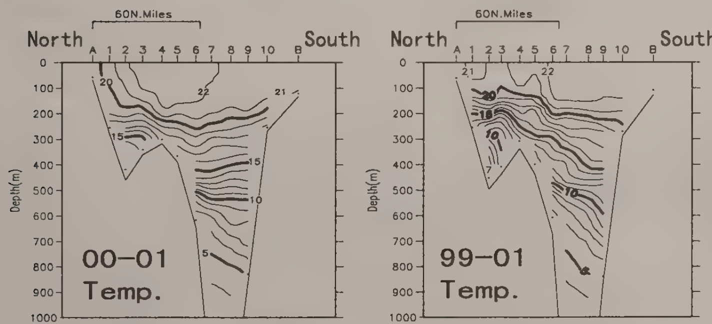
第30図A　観測線位置図

Fig.30A Location of observation lines.



第30図B　TK線, PN線およびPK線における黒潮の地衡流量の時系列（TK・PN線は700×10⁴Pa基準，PK線は1000×10⁴Pa基準）

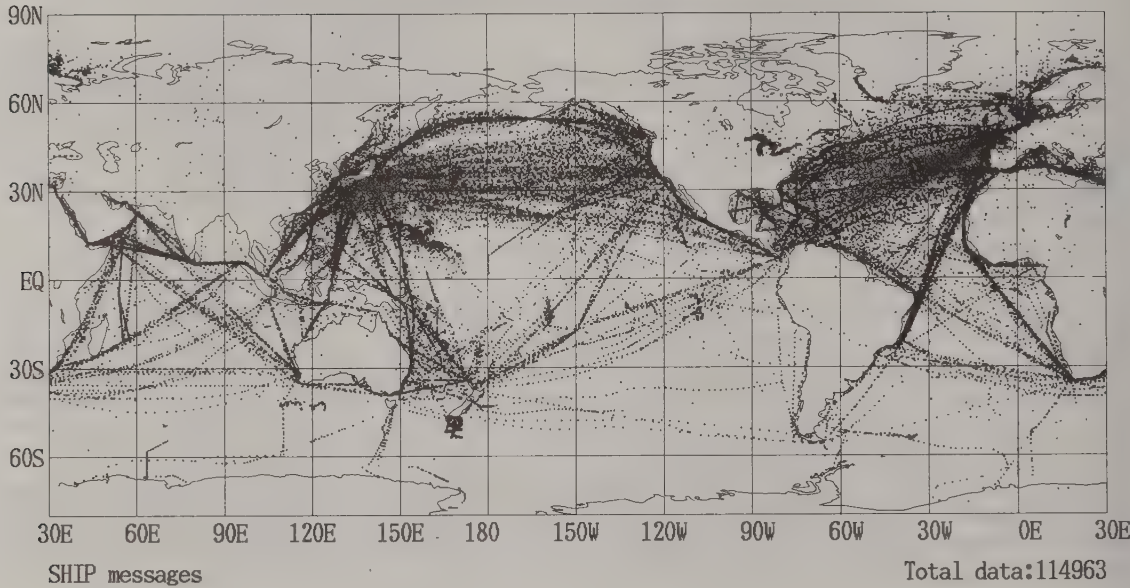
Fig.30B Time series of the geostrophic transports at the TK, PN and PK lines, calculated referring to 700×10^4Pa(TK, PN) and 1000×10^4Pa(PK).

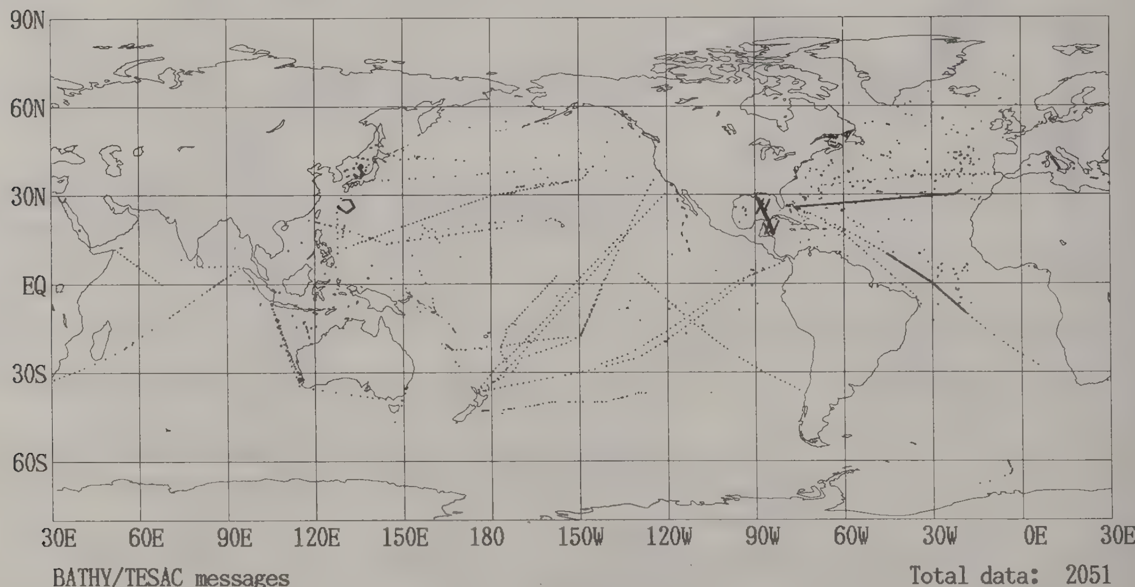


第30図C　ＴＫ線の水温断面図（2000年1月（左）、1999年1月（右））

Fig.30C Cross sections of water temperature along TK line in January 2000(left) and January 1999(right).

Geographical Distribution of Oceanographic Data

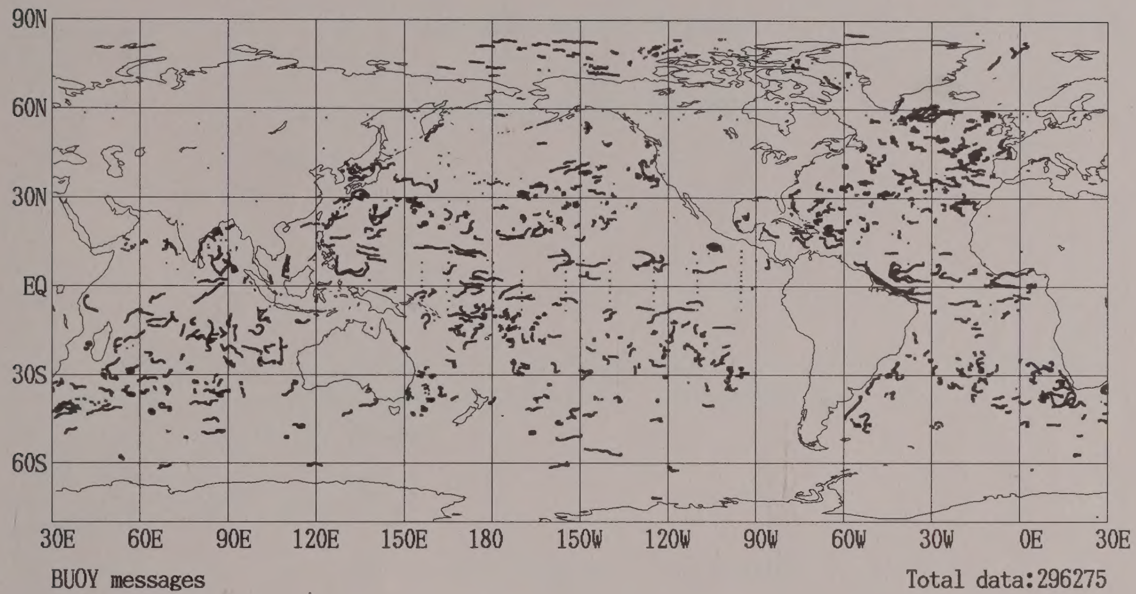


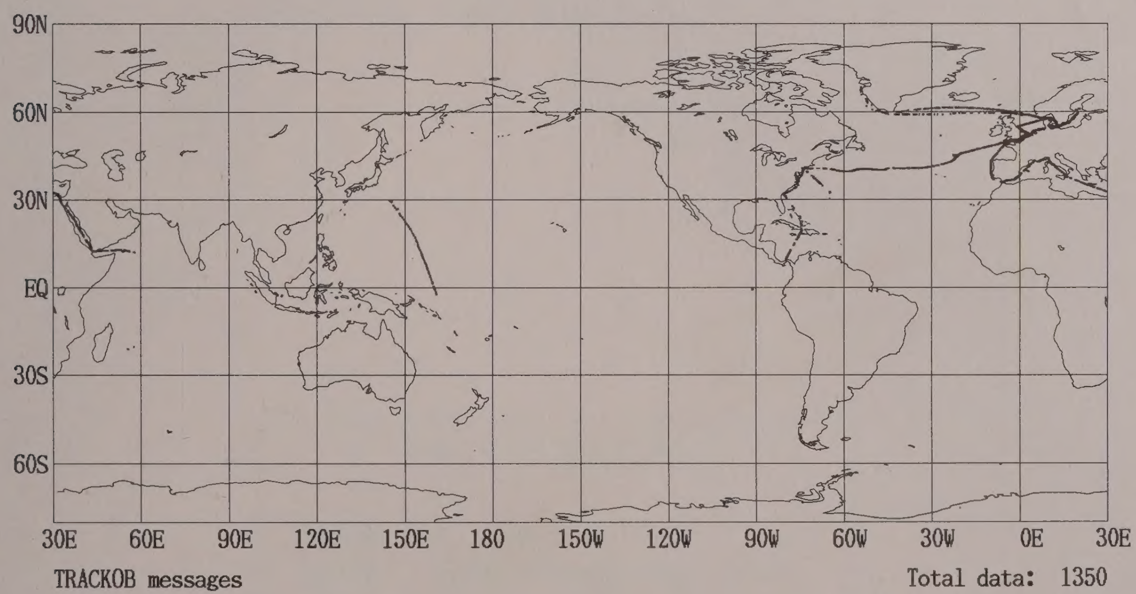


第31-1図　測点分布図(2000年12月)

Fig.31-1 Geographical distribution of SHIP messages (SST data, top) and BATHY/TESAC messages (subsurface temperature data, bottom) for DEC 2000.

Geographical Distribution of Oceanographic Data





第31-2図　測点分布図(2000年12月)

Fig.31-2 Geographical distribution of BUOY messages (buoy drift and SST data, top) and TRACKOB messages (ship drift and SST data, bottom) for DEC 2000.

気象庁海洋月報

Monthly Ocean Report

December 2000 (No. 96)

本月報掲載の2000年12月のプロダクトには、気象庁が観測したデータ及びGTS（全球気象通信網）を通じて入手した国際気象通報式による通報のほか、下記の機関等から提供いただいたデータを使用しています。御礼申し上げます。

防衛庁、水産庁、海上保安庁

海洋科学技術センター、（財）日本海洋科学振興財団、（社）漁業情報サービスセンター

水産試験場等（北海道、青森県、岩手県、宮城県、秋田県、福島県、茨城県、東京都、新潟県、石川県、福井県、静岡県、愛知県、三重県、京都府、和歌山県、鳥取県、島根県、徳島県、高知県、佐賀県、宮崎県）

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